

FLIGHT

The
AIRCRAFT
ENGINEER
&
AIRSHIPS

First Aero Weekly in the World
Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport
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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

- Nov. 12-27 Paris Aero Salon
Nov. 15-26 International Air Navigation Congress (Paris)
Dec. 1 Lecture, "The Present State of Airship Development," by Major G. H. Scott, C.B.E., A.F.C., before R.Ae.S.
Dec. 15 Lecture, "Development of the Fighting Aeroplane," by Capt. F. M. Green, before R.Ae.S.
1922.
Jan. 5 Lecture, "Specialised Aircraft," by Wing-Com. W. D. Beatty, before R.Ae.S.
Jan. 19 Lecture, "Aeroplane Installation," by Brig-Gen. R. K. Bagnall-Wild, before R.Ae.S.
Feb. 2 Lecture, "Radiological Research," by Dr. V. E. Pullin, before R.Ae.S.
Feb. 16 Lecture, "Methods of Instruction in Aeroplane Flying," by Sq.-Leader Portal, before R.Ae.S.
Mar. 2 Lecture, "Testing Aircraft to Destruction," by W. D. Douglas, before R.Ae.S.
Mar. 30 Lecture, "The Design of a Commercial Aeroplane," by Capt. de Havilland, before R.Ae.S.

EDITORIAL COMMENT



AVIATION, as a whole, should be grateful to Sir Hugh Trenchard for his address to the Scottish branch of the R. Ae. Society, which we printed almost in full in our issue of last week. Although neither we ourselves, nor the majority of those connected with aviation, find it possible to agree either with his premises or his conclusions in so far as these concern the civil side of aviation, he has at least cleared the air and allowed us to see with considerable distinctness the view taken by the Service of the future of the civil side of the movement. The Chief of the Air Staff approaches his subject with a mind trammelled by the traditions and predilections of the fighting man, and has no eyes to see the things which appear obvious to those of wider outlook. His views are frankly disappointing and, be it said, do not appear to coincide with others he has expressed in the past. Still, we are content to take them as they are, and to deal with them on what we conceive to be their merits.

He tells us he is not unsympathetic to civil aviation—then proceeds to say that civil aviation is not, and so far as he can discern can never be, of the slightest use to Empire defence. If, he says, civil aviation can be made to pay in any other country, then it will become vital to the Service in this country; if it can be made to pay in a large way in this country, even though it cannot in others, then it will become a factor which will establish the predominance of our air supremacy for all time. Is this not what we and others have been saying for years past? Truly it is, with the difference that every supporter of civil aviation believes it can be made to pay, and backs the opinion by figures, while the Chief of the Air Staff makes his statement apparently for the purpose of arguing that it cannot. How does he think to dispose of the fact that France, America, and Germany share in the belief and are backing that belief with money and encouragement of every kind, so that in the air they are rapidly leaving us far behind? He judiciously refrains from saying anything at all about the things that are being done in countries other than our own.

His duty, he says, is to provide the country with

the cheapest possible form of effective insurance against attack from the air. To do this he would devote all the funds that can be spared to the strengthening of the military air force by machines and pilots. He would devote the money to securing an extra five or six squadrons, and would raise these by the aid of some sort of Auxiliary Air Force, a citizen force like the Territorials, but not necessarily on the Territorial basis altogether. The Service would then lead, and trade would follow the flag.

**Whence
this
Attitude?**

We do not profess to be able to understand Sir Hugh Trenchard's attitude of mind. He thinks the present subsidy to civil aviation might possibly provide him, as a reserve, with a limit number of 100 machines and 100 pilots, and prefers his five or six partially trained auxiliary squadrons to these. On the face of it, we do not think this indicates clear thinking at all. We take it he is thinking that his five or six squadrons would be complete with their ground organisation, which would be lacking in the case of the 100 civilian pilots. But why should it? We have suggested in these pages more than once that if the civilian element is to supply a reserve against emergency it should be organised on the lines of the Royal Naval Reserve. If it were, we can see more than the five or six squadrons eventuating out of even that number of machines and pilots, with all the ground staffs and other personnel attached to civil air transport. The whole thing seems so extraordinary to us that we are perforce compelled to look behind the scenes for the influence which has led the Chief of the Air Staff to go back on opinions previously expressed and to show himself as the champion of Service aviation and the enemy—for his speech shows that this is hardly too strong a term—of the civilian side.

Our argument has always been that both sides of aviation are of equal necessity to the prosperity and safety of the realm and the Empire. In that view we are supported by all who have taken the trouble to think more than superficially about the subject, or who have approached it from any but the narrow sectional standpoint of the Service. At the very present moment our representatives are at Washington engaged upon the discussion of ways and means for limiting armaments, yet this is the time chosen by the Chief of the Air Service to administer a snub to civil aviation and to plead for the extension of our military resources. Worse still, if his views met with general acceptance, they would have the effect of robbing the military side of its most valuable auxiliary. It passes understanding.

**The
Washington
Conference
and
Aircraft.**

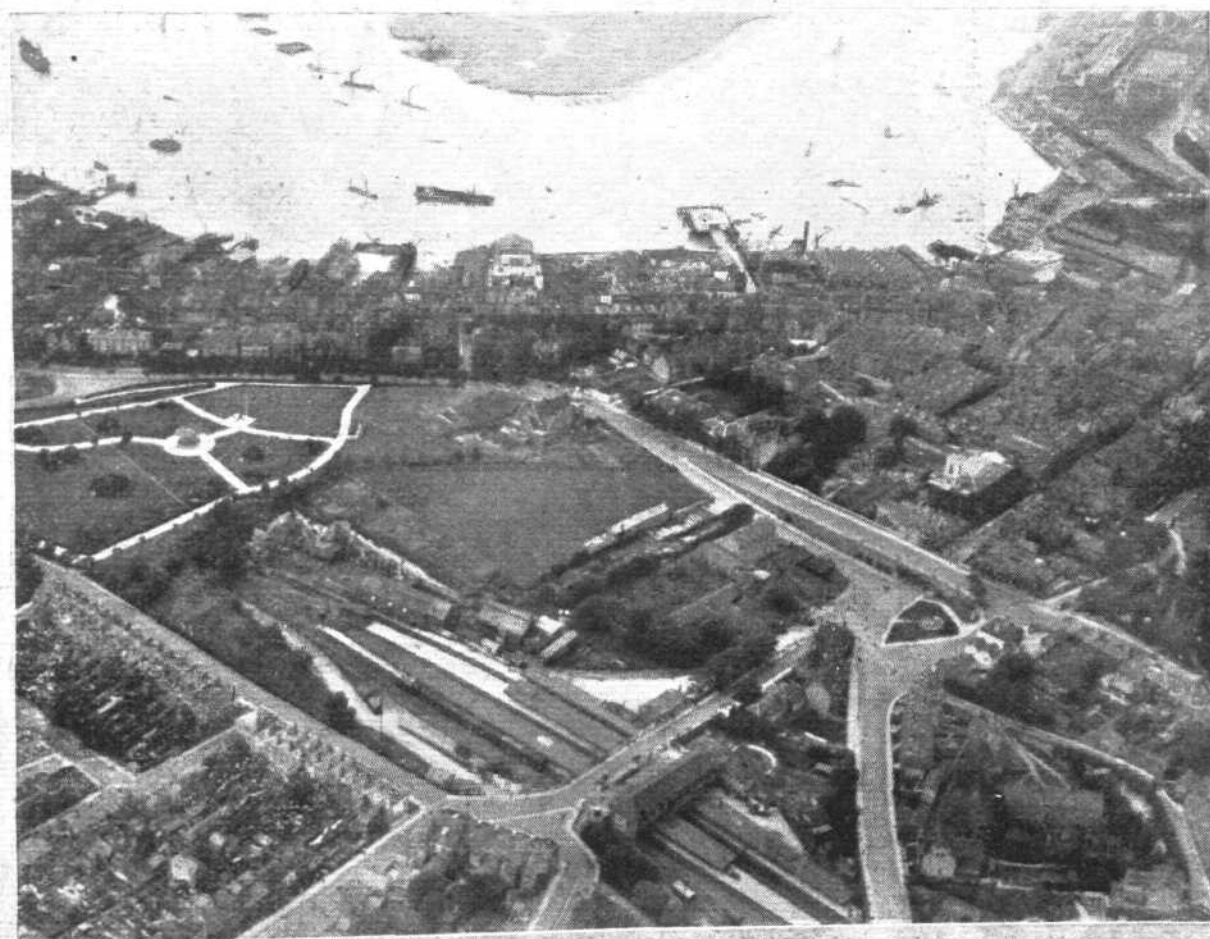
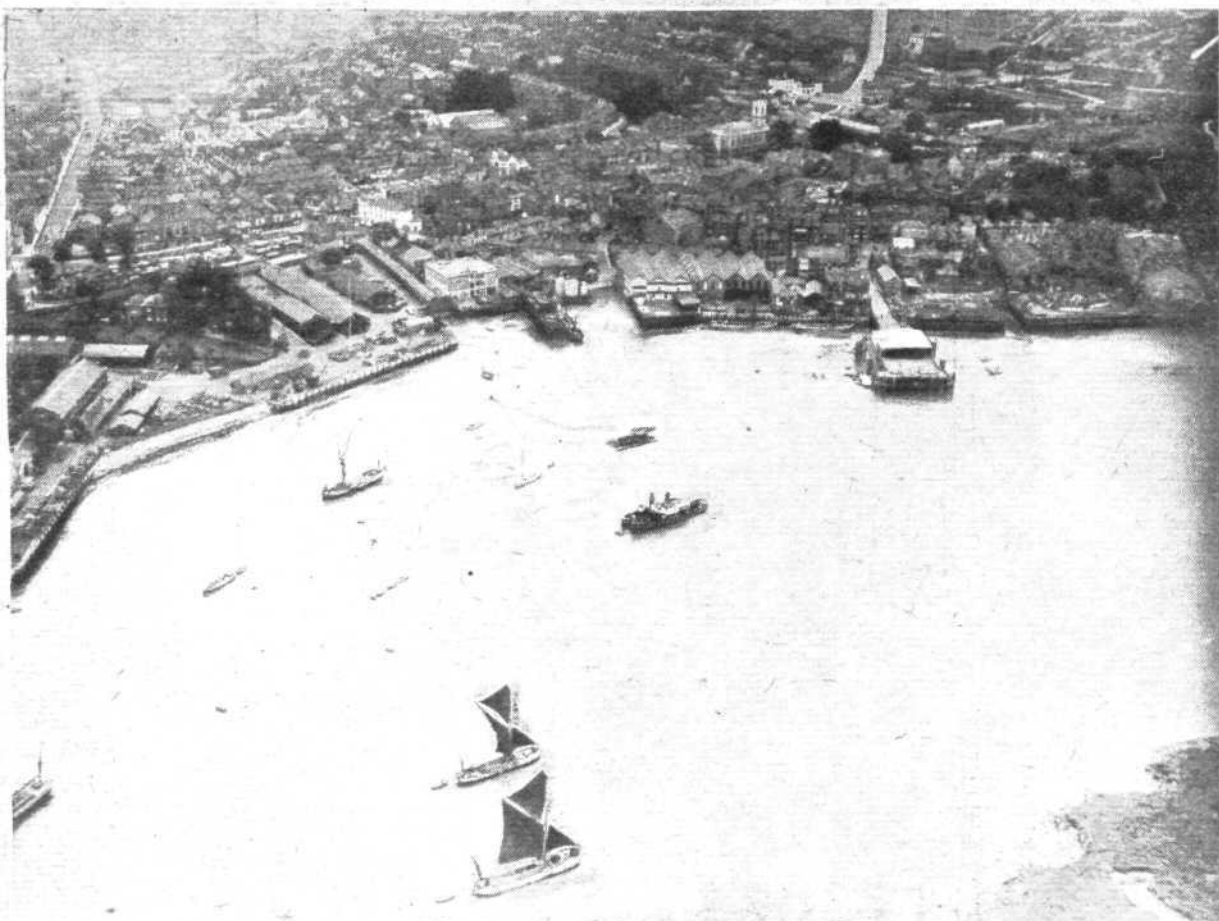
Speaking at Amiens recently, the Chief of the General Staff, Sir Henry Wilson, suggested that it was for those who govern the world to ponder whether, if they wanted to limit the horrors of war, it would not be better to limit aeroplanes rather than submarines. He had been speaking of the bombing of defenceless towns from the air, which, he said, seemed to be on the whole a development of a movement for killing women and children. Soldiers did not like it; they would prefer to fight matters out themselves.

This sounds rather like a lead to the Washington Conference, coming from so distinguished and

influential an authority, a lead which we hope may produce at least some useful discussion even if it should result in nothing tangible. The subject is a very difficult one. For reasons which are obvious, we do not desire to see any restrictions placed in the way of the legitimate development of aerial transport. But unless something of the sort is done, we do not quite see how the desired end is to be attained with any absolute safety from abuse by any Power minded to take advantage. Unquestionably aviation will develop. More efficient machines than we have ever known, and more of them, will be built. Their radius of action and their weight-carrying capacity will be increased out of knowledge, and while it is true that the ideal commercial machine is not the best adapted for war, conversely, any machine is better than none when it comes to aggressive action against a country which is ill-prepared to resist attack from the air.

Apparently, the British delegates to Washington are not inclined to go very far in the limitation of aircraft and their use in war. It is pointed out that, while the submarine may be the engine of assassination at sea, it does not exert any great moral pressure on an enemy. On the ground that its murders are useless and fail of effect, our delegates are all for forbidding its use by belligerents. The case of aircraft they argue, is different, because the bombing of an enemy's cities may exercise such a powerful moral and material effect on his population that his Government may be brought to admit defeat or at least to make a peace less advantageous to himself than would be the case were the issues of war left to the armies in the field. Unquestionably the argument is a very strong one, but the question is whether the material end justifies the immorality of the means. Our own view is that it does not, and we should be extremely pleased if any effective means could be devised of ensuring that aircraft attack on open towns and cities should not be carried out. It must be clear, however, that we do not desire to achieve this end by limiting development of commercial aircraft either as to construction or as to numbers. That is the last thing in the world to be countenanced.

Is it, however, any use to pass international laws forbidding this form of warfare? Poison gas was expressly excluded by the Laws of Nations, yet we know what happened in the War. The sinking of peaceful merchantmen again was excluded from the legitimate operations of war, but the Germans carried it to lengths which set the whole civilised world against them and their fiendishness. Would a law against the bombing and gassing of open towns be of any more avail? We are inclined to think it might with the example of Germany before us. It was her utter disregard of all the laws and usages of civilised war that caused the whole of the civilised peoples to take up arms against her, culminating in the declaration of war by the United States. Is it probable that an aggressively-inclined Power, with that example to read, would run the risks that in the end brought unparalleled ruin and disaster upon Germany? We do not think so, and we incline to the belief that if the Washington Conference agrees that there shall be no more war made on civilian populations, its decrees will be observed, not always because treaties and solemn bonds are not invariably regarded as mere scraps of paper, but because of the dire consequences that must inevitably befall any Power which outraged its undertaking.



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LONDON-PARIS FROM THE AIR, AS SEEN FROM A HANDLEY PAGE MACHINE :
No. 15.—Chatham, as seen from both sides of the river.



THE · PARIS · AERO · SHOW · 1921

BY THE TECHNICAL EDITOR

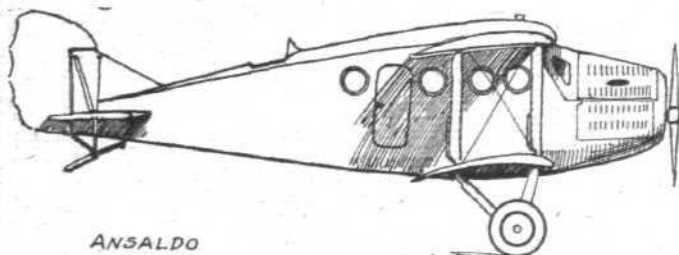
By making use of the Handley Page Air Service we were able last week to get through in time a brief report on the machines exhibited at the Grand Palais, with side views of each machine, and some general views of the exhibition. The first copies from the presses were hurried out to Croydon, placed on board a Handley Page machine, and delivered at our stand in the Grand Palais on Thursday afternoon. Thus, copies of *FLIGHT* were actually on sale to the public about twelve hours earlier at the Show than in London, and at least 24 hours earlier than they would have been had they been sent by rail and steamer in the ordinary way. Comment is, we think, superfluous. In the following notes the various exhibits are dealt with in detail.—Ed.

ANSALDO AERONAUTIQUE

366, Corso Francia, Turin, & 21, Rue Demours, Paris

This Italian representative is showing a single-engined cabin machine which is announced to be strictly *en serie*. The machine arrived a couple of days late, and a side view of it could not, therefore, be included in our issue of last week. Of the type "A. 300 T," this machine has a Fiat engine of 300 h.p. mounted in the nose, with radiator in front. The

wheel track. To attain this it has been necessary to attach the undercarriage struts to the lower plane, and hence a



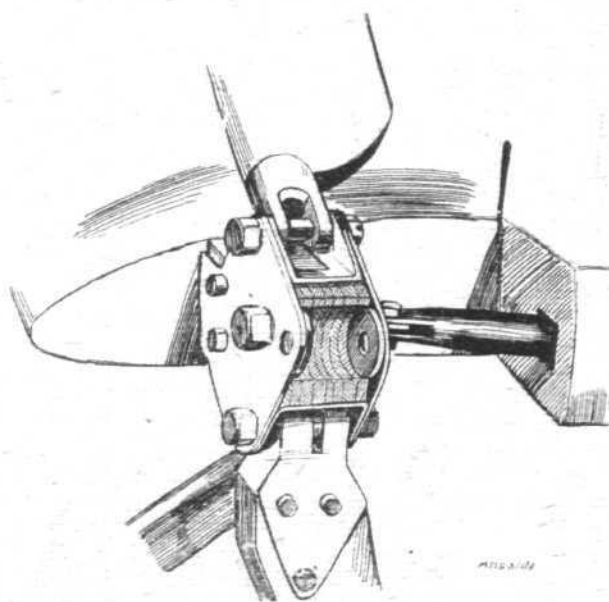
ANSALDO

Side view of the Ansaldo "A. 300 T."

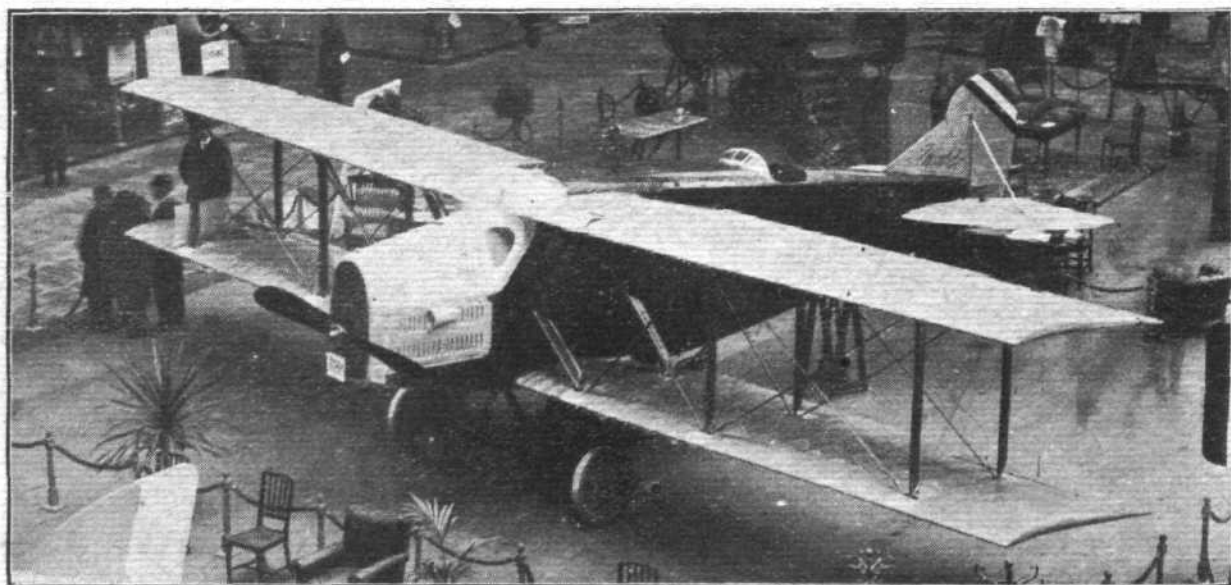
fuselage is of rectangular section, and covered with ply-wood. The cabin is well appointed, and has room for six passengers, who are seated in wickerwork chairs. A feature of the Ansaldo cabin is that it is provided with two small front windows, which give a reasonably good view, at any rate as regards the front passengers. These windows are provided by sweeping—in the fuselage covering in front of the cabin, which is made possible by the smaller width and depth required for the engine. In a way this feature of the cabin may seem of small importance, but, as a matter of fact, it adds greatly to one's comfort and peace of mind to be able to look out in the direction in which the machine is going.

The pilot is placed aft of the cabin, and there is a circular window in the wall, by means of which communication between pilot and passengers is made possible, for instance by handing messages backwards and forwards.

A feature of the Ansaldo "A.300 T," is the very wide



The wing spar attachment on the end of the wing roots of the Ansaldo "A. 300 T."



The Ansaldo Passenger Machine.

somewhat unusual strut arrangement has been adopted. Short wing roots are attached to the fuselage, and to these the planes are secured. From these points of attachment, struts run to the sides of the fuselage, approximately half-way up the sides. Thus, the short wing roots are braced permanently to the body, and the undercarriage Vees are secured to the ends of the roots. A further series of struts triangulate the undercarriage structure, which looks tremendously strong, but would appear to offer quite a lot of resistance. With a power expenditure of 50 h.p. per passenger at full power, and a good performance, the Ansaldo should be a very useful machine for routes on which a large number of passengers is not to be counted upon.

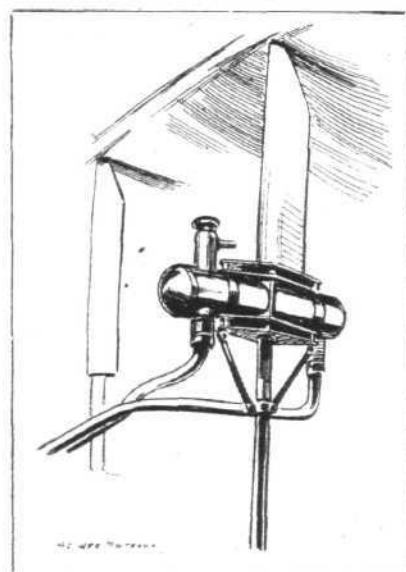
ATELIERS DES MUREAUX

Les Mureaux (S.-et-O.), and 3, Rue d'Anjou, Paris

It is probable that the exhibit on this stand is not particularly popular with French constructors. It consists of one of the latest Vickers-Vimy-Commercial machines, with two 450 h.p. Napier Lion engines. The machine is to be used by the Grands Express Aériens, and the type will in future be built under licence by the Ateliers des Mureaux, it being a stipulation in the French Government subsidy regulations that the aeroplanes used must have been constructed in France. It is a rather curious coincidence that the identification letters on this, the first British machine to be sold to a French air-line, should be "F-ADER," thus being a reminder of the first man to make a free flight in France. One does not know whether or not these registration letters are a mere coincidence,

or whether there is more behind it. The French have a neat way of "wangling" these things, as, for instance, when the Nieuport racer flown by Lecomte in the Italian races, bore the letters "F-SADI."

The Vickers-Vimy-Commercial, apart from certain differences in dimensions, is very similar to the older model with lower-powered engines. The main external difference is that, when cowed-in, the Lions appear to rest on the lower plane, although, from a strictly structural point of view, this is not so, the engine-bearers resting on a structure of steel tubes which projects forward of the leading edge.



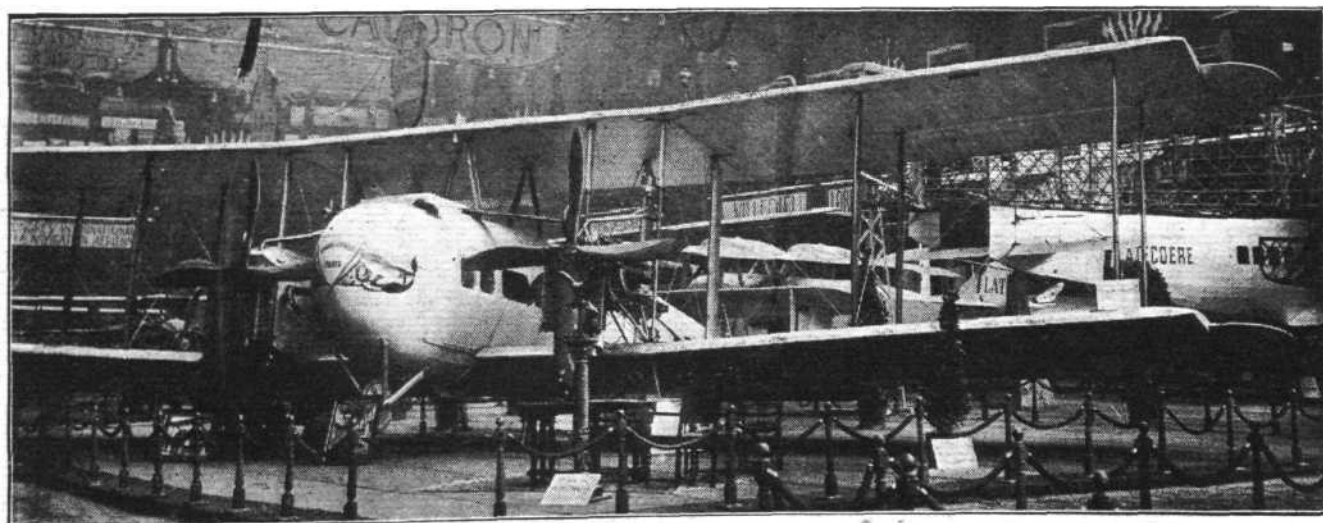
Header tank, mounted on the wing strut.

The cabin, which has ample accommodation for 11 or 12 passengers, is beautifully finished in repoussé leather, and is, perhaps, the best appointed in the Show. One cannot help thinking, however, that a few windows or skylights in the roof would be an improvement, as the cabin, especially with the dark leather finish, is inclined to be somewhat scantily lighted. On the constructional features of the machine, there is no need to dwell here, as they are

mainly the same as those of the older model, which is already so well-known. There is no reason to expect that as regards reliability and "service," the new machine will be any less successful than have been the older ones, while the extra power should result in a greatly improved performance. We congratulate the Grands Express Aériens on their foresight and moral courage in choosing the machine which they consider best suited for their purpose, even if this means going abroad for it. Messrs. Vickers Ltd., are likewise to be congratulated upon having produced a type of commercial machine which has won recognition to such an extent as to lead to its construction abroad for foreign air-lines. We are quite certain that this is only the first of a long series of British-designed machines to be seen abroad, and is, we think, an earnest of the day when, if our designers persevere and remain dissatisfied with anything which is not the best of which they are capable, Britain provides aircraft for the commercial aviation world, much as she is now doing in the matter of seaborne craft.

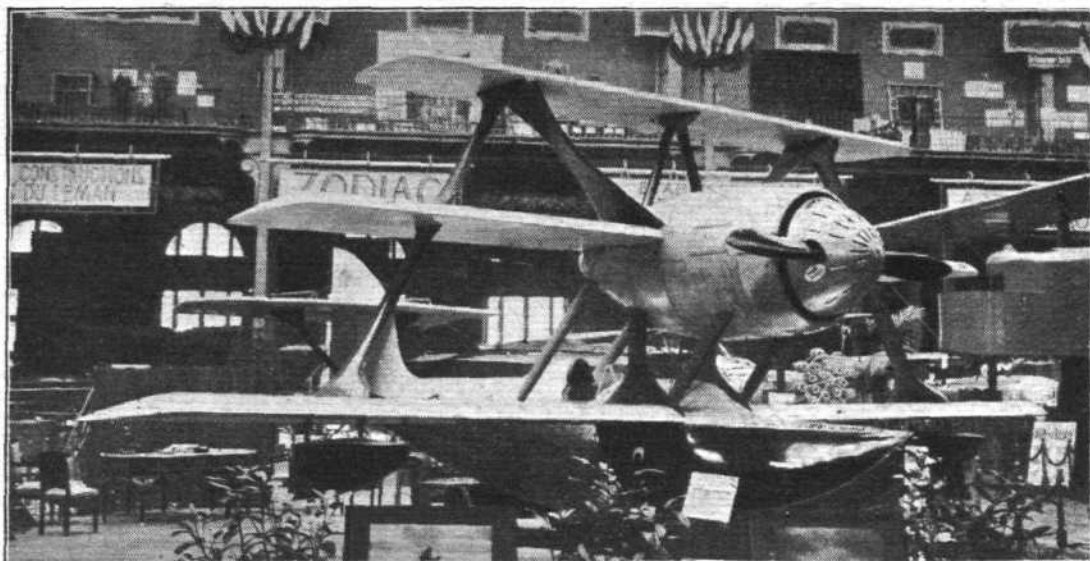


View inside the Vickers-Vimy-Commercial exhibited on the stand of Ateliers des Mureaux. The machine, which has been purchased for use by the Grands Express Aériens, is richly finished in leather repoussé work.



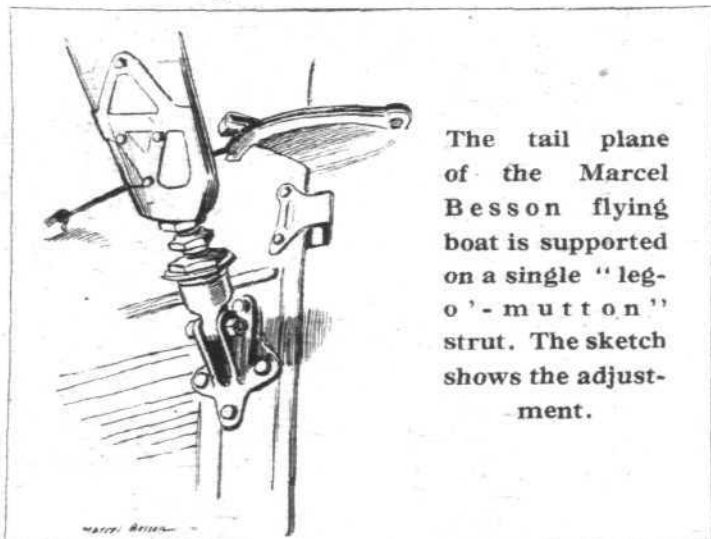
THE VICKERS-VIMY-COMMERCIAL, TWO NAPIER "LION" ENGINES: The identification letters on this machine are "F-ADER."

The Marcel Besson single-seater flying boat type "H.6."



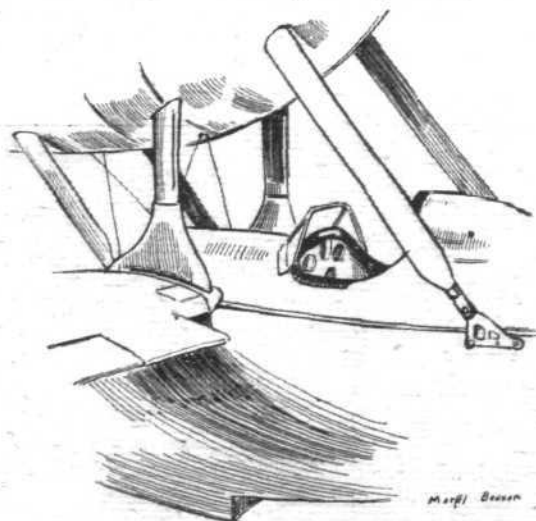
**SOCIÉTÉ DE CONSTRUCTIONS AÉRONAUTIQUES
ET NAVALES MARCEL BESSON**
5, Rue Saint-Denis, Boulogne-sur-Seine

At the Paris Show of 1919, this constructor exhibited a small triplane flying boat two-seater, with one of the, then, new 60 h.p. Rhône engines. At the time one was somewhat in



The tail plane of the Marcel Besson flying boat is supported on a single "leg-o'-mutton" strut. The sketch shows the adjustment.

doubt as to the feasibility of getting a flying boat, however lightly built, off the water, with two up, and only a problematical 60 h.p. wherewith to do it. We understand that, as a matter of fact, that machine did get off, after having been fitted with a more powerful engine. At the present Show,



Sketch of the engine struts and cockpit of the Marcel Besson flying boat.

a single-seater boat is exhibited, which shows few, if any, traces of the earlier model. This machine, which is a very nicely-built job, has a most unusual wing arrangement. As will be seen from the accompanying photograph, the lower plane is the largest and the top plane the smallest. The

strutting is so arranged that a system of triangulation is provided which, presumably, renders bracing wires superfluous, as none are incorporated in the design. One is somewhat at a loss to account for the reasons which led to this unusual arrangement, as the effect of the small top plane would appear to be that the centre of thrust would be a very considerable distance above the centre of resistance. Also, in ordinary triplane arrangements, the top plane is the most efficient and as this is quite diminutive in this machine—which is, by the way, known as the H. 6—it would appear that the whole triplane combination is not likely to prove very efficient, even allowing for the absence of wire bracing.

The engine, a 130 h.p. Clerget, is mounted in a streamline power "egg," which also contains the petrol tank. It drives a tractor screw, having a spinner over the boss. The pilot sits just aft of the trailing edge of the wings. There does not appear to be much room anywhere for mails, nor is the machine probably capable of carrying more than a relatively small useful load.

A model of an extraordinary quadruplane is also shown on this stand. This machine, which is to have a bagatelle of 1,800 h.p. as her power plant, has its four planes placed very close together, certainly not more than about half of the chord, but the planes are staggered in relation to each other. Exactly what is the reason for such an arrangement, which must be costly to build and appears rather difficult to brace properly, one does not presume to be able to state. There is to be a very large cabin on this machine, which is to form a unit separate from the boat hull. One gathers that the machine, which is actually nearing completion at the works, is intended for work between Marseilles and the coast of Africa. Certainly, whatever may be one's opinion of French constructors, they are not lacking in pluck nor in imagination.

BLÉRIOT-AÉRONAUTIQUE

3, Quai du Maréchal Gallieni, Suresnes

THERE are not many machine at the Paris Salon this year, which one would stop and look at twice. The majority are very ordinary straightforward pieces of design, with here and there some frankly bad ones. To neither of these categories can the Spad-Herbemont 45 be said to belong. It is certainly not ordinary, and nobody would probably care to say that it is bad. M. Herbemont's record as a designer is such that his work is always entitled to a respectful consideration. The "Mammouth" exhibited in 1919 was about as poor a piece of design as it was possible to imagine, but no one who saw that machine could imagine for a moment that Herbemont had had anything to do with its design. That he did have something to do with so altering it that, by the aid of Casale's skill as a pilot, it was possible to coax it up to about 3,000 metres, is now fairly well-known, but it should be made clear that originally the machine was *not* a Herbemont. Indeed to anyone at all familiar with his work, it was obvious that Herbemont would never have committed such an indiscretion.

However, to return to the present machine. The parentage of the 45 is obvious. It has Herbemont written bold in all its lines—even to the single I-strut on each side. And this in spite of the fact that the machine is a four-engined passenger carrier, with seating accommodation for 17 passengers *plus* a pilot, a navigator, and an engineer, bringing the total up to 20.

The fuselage is of the *monocoque* type, and a very beautiful

piece of work. The extreme nose-piece of another fuselage is also exhibited, and from this one can obtain some idea of the construction. It appears that the fuselage is built-up of three laminations, of which the central one is longitudinal, the inner and outer forming an angle with it. The strips used are quite narrow, at any rate in the nose where the curves are fairly sharp. Here the strips appear to be only about $1\frac{1}{2}$ in. wide. Several longitudinal members run from nose to stern, and into these the ends of the relatively short strips are housed, much after the fashion of the planking of a flying-boat in the keel and chines. The finished result is a very

cabin accommodates 15 passengers. Aft of the cabin is a lavatory on the starboard side, entrance to which is through a door in a longitudinal partition. On the port side, there is a small compartment, which has an open cockpit in its roof. Immediately under this cockpit is a seat, while against the port wall, placed at floor level, is yet another seat. These bring the total passenger accommodation up to 17.

The pilot's cockpit is in front and on a higher level than the cabin, its floor being about two feet higher than that of the latter. A doorway gives access from the cabin to the pilot's cockpit, but as there is no provision made for a door

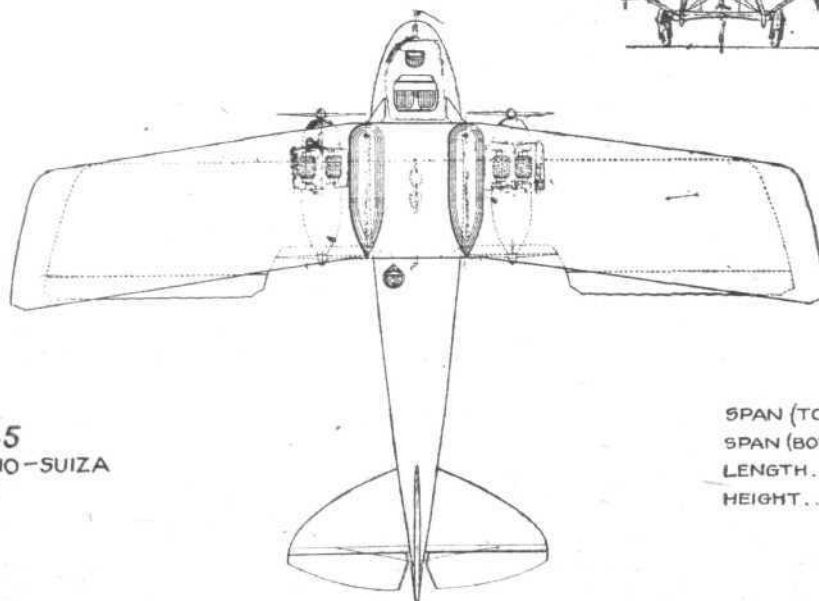
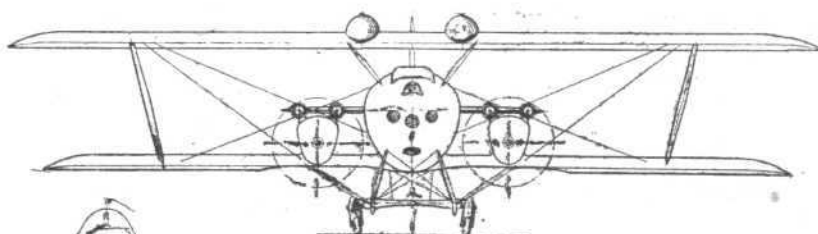
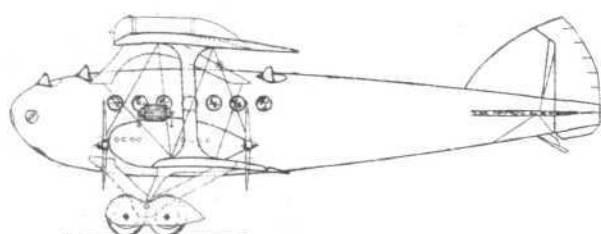


THE SPAD 45 : Fitted with four 300 h.p. Hispano engines, this machine carries a crew of three and seventeen passengers.

neat, boat-built body of good lines and, one believes, great strength. Strangely enough, the engine nacelles are of similar construction, and not of metal sheet, as might have been expected.

The cabin is roomy, and the seating accommodation is somewhat unusual, inasmuch as along one side of the cabin, there are two rows of seats, whereas on the other (port) there is only one row. Each of these rows comprises four seats, and against the forward bulkhead of the cabin there are another three, two side by side on the port side and one on the starboard, these three seats facing aft. Thus, the main

one imagines that the cabin may be found somewhat draughty. The pilot sits on the port side, and on his right is a fairly large space which will, presumably, be occupied by the engineer. This cockpit is partly open forward so as to give access to the extreme nose of the machine, where there is a roughly hemispherical space for the navigator. This "chart room" is fitted up with wireless, maps, navigation instruments, etc., and has an open cockpit in its roof. The navigator, and also to a smaller extent the pilot, can look forward and downward through three circular windows in the extreme nose of the fuselage, so that for ascertaining



SPAD 45
 4, 300HP HISPANO-SUIZA
 ENGINES

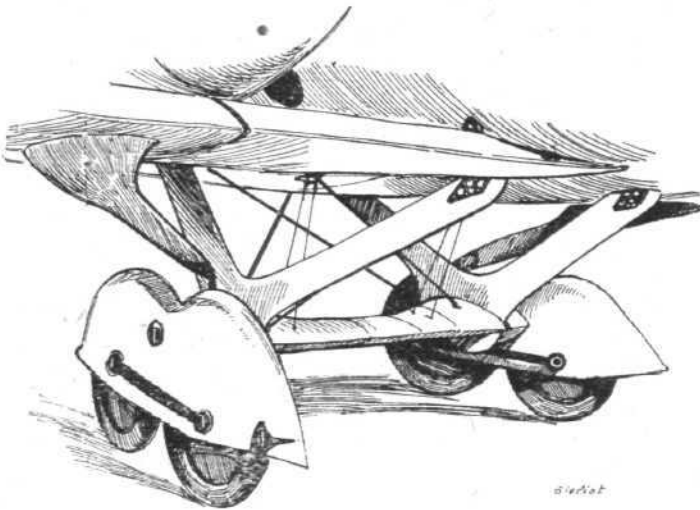
SPAN (TOP).....70'-5"
 SPAN (BOTTOM).....64'-7"
 LENGTH.....51'-10"
 HEIGHT.....18'-10"

THE SPAD 45 : General arrangement drawings.

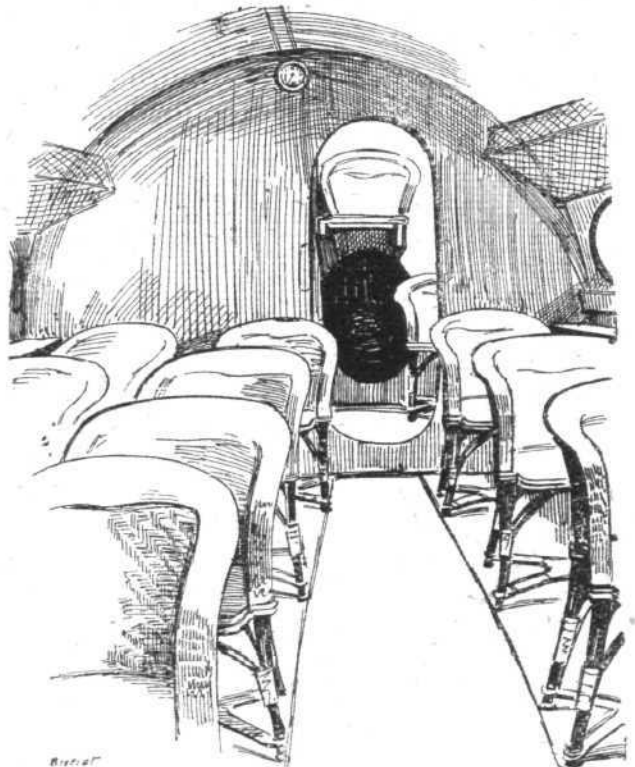
drift, etc., the navigator need not expose his head to the wind. Altogether the cabin appears well thought-out. There is a trap door in the floor, leading to the "basement" below, from which another door leads to the lower plane. Corresponding to this door is one in the inner wall of each engine nacelle, obviously for the engineer to crawl through so as to get at his engines. As exhibited, there is no provision on the wing for keeping the engineer from being blown into space, but one understands that it is intended to fit some form of guide rail with netting.

The engines—four Hispano-Suizas—are placed on the wings tandem fashion. This is the feature one likes least of all on this machine. Past experience with tandem airscrews has not been such as to give any cause for optimism as regards efficiency, and we are quite certain that M. Herbemont would have been better advised to use two engines of greater

landing wires run from the lower spars up to the sides of the body, at the foot of the centre-section struts. The spars are of the box type, and bound with fabric throughout. Ailerons are fitted to the lower planes only, and are operated in the usual Spad fashion by cranks and tubes inside the wings. As in the Spad Berline, the two petrol tanks are placed on top of the upper wing, with gravity feed direct to the engines.



The undercarriage of the Blériot four-engined machine.



View inside the cabin of the Spad 45.

power. He may have been influenced by the lack of French engines, suitable for the purpose, and possibly also by the somewhat problematical advantages of splitting the power up into four units, so that if one engine fails, the power is reduced by one-fourth only instead of by one-half. It is doubtful if this is so in practice. For instance, if the front engine stops, the propeller of the rear engine is deprived of the slip stream. Consequently, its propeller must be of too coarse pitch and the efficiency suffer correspondingly.

The engine nacelles and their internal framework, engine-bearers, etc., rest on the lower plane, and appear to be supported only on the struts which slope outwards at a fairly flat angle from the undercarriage. This looks somewhat insufficient, but as the wing bracing would probably help somewhat, although indirectly, owing to the pin-joint in the spars just outside the engines, the structure may be better than would appear at first sight.

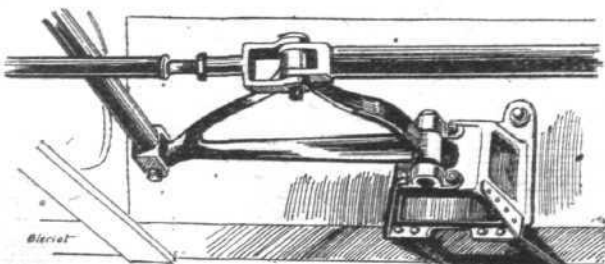
Perhaps the most daring feature of the design is the use of a single I-strut on each side. While this arrangement has proved quite satisfactory on the smaller Spads, it is somewhat staggering to see a four-engined machine with only one strut on each side. However, the wing bracing looks substantial, and the single strut may be sufficient. Two lift wires (streamline, in duplicate) run from two points on the side of the fuselage to the upper spars at the points of attachment of the I-strut cross-piece. Another two wires run from a single point on the front spar just outside the engine nacelle to the same points on the upper spars. The

The undercarriage is shown in one of the accompanying sketches. There is a substantial Vee under the inner end of each wing root, and the axle carries two wheels in tandem on each side. The wheels are fitted with mud guards, after the fashion of the Curtiss "Eagle."

As regards the usefulness for commercial purposes, it would appear that, except as a sort of passenger carrier *de luxe* the machine would be extravagant. Taking the total power as 1,200 h.p., and the number of passengers carried as 17, the power per passenger is over 70 h.p. This does not appear a particularly good commercial proposition. We have in this country machines with approximately the same speed, carrying one passenger for each 45 h.p.

The main characteristics of the Spad 45 are as follows: Passengers, 17; engine power, 1,200 h.p.; speed (estimated), 124 m.p.h.; span, upper plane, 70 ft. 5 ins.; lower plane, 64 ft. 10 ins.; length o.a., 51 ft. 10 ins.; height, 18 ft. 10 ins.

Two more complete aeroplanes are exhibited on the Blériot stand. One of these is a Berline, exactly similar to those used on the London-Paris route. As this type was fully described and illustrated in our issue of July 7, 1921, we need



An aileron crank inside the wing of the four-engined Spad 45.



THE SPAD 34: This machine is a side-by-side, dual control school machine, with 80 h.p. Le Rhône engine.

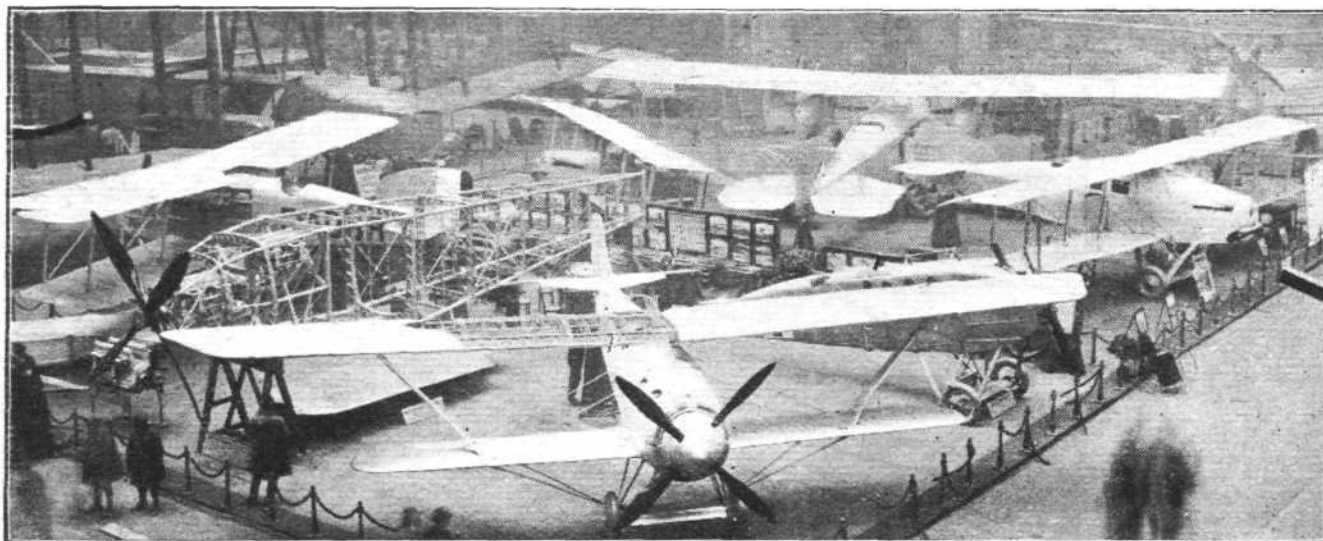
make no further reference to it here. The second machine is a neat little side-by-side school machine with dual controls. This machine is known as the Spad type 34. It is fitted with an 80 h.p. Le Rhône engine, and is similar to other Spads, except that its fuselage is of rectangular section instead of the usual Spad monocoque construction. The wings show the same sweep-back of the top plane, and the same single I-strut on each side. The question side-by-side or tandem was a vexed one years ago, and it is interesting to see a modern designer choose the former. It is claimed that with this arrangement the pupil can obtain a better idea of how the instructor handles the machine; while sitting in the same cockpit has the advantage of doing away with the practice of knocking the pupil on the head with a spanner when he makes a mistake. Otherwise this machine does not appear to call for any special comment. Its main characteristics are as follows: Engine, 80 h.p. Le Rhône; wing area, 226 sq. ft.; weight, empty, 1,050 lbs.; weight of fuel, 154 lbs.; useful load, 400 lbs.; weight, fully loaded, 1,604 lbs.; weight, per sq. ft., 7.3 lbs.; weight, per h.p. 20 lbs.

SOC. ANN. DES ATELIERS D'AVIATION LOUIS BREGUET

115, Rue de la Pompe, Paris, and Velizy (Seine-et-Oise)
LOUIS BREGUET makes a strong display this year with all-metal construction. One complete machine of this type is exhibited, and the fuselage of another, the "Leviathan,"

of an "Avion Sanitaire." As incorporating novel features, the complete machine (all-metal) type "19 A. 2," is, perhaps, the most interesting. This machine, known as the Breguet "Sesquiplan," is designed for war work (*Grande Reconnaissance*), having a very complete equipment of guns, cameras, wireless, etc. All these paraphernalia are, however, of minor interest at the present moment, as compared with the construction of the machine entirely in metal. The fuselage is of girder construction, with Duralumin tube longerons and struts, and tie-rod bracing. Formers and stringers bring it up to a circular section. The covering in the rear portion of the fuselage is fabric, but in front a peculiar metal covering is employed. This takes the form of a series of channel-section strips, whose flanges are held together with tubular rivets. As the metal is only about .15 mm. thick, it will probably make a very fair imitation of stage thunder when the engine is running.

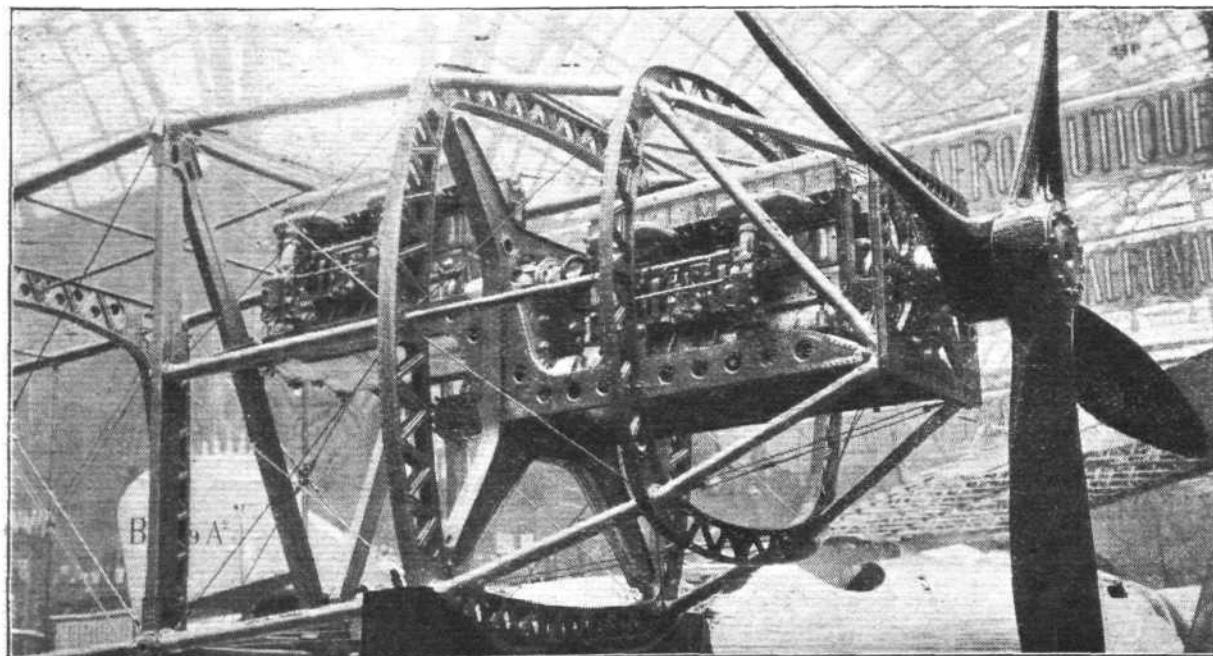
The wings, of which the upper is considerably larger in span and chord than the lower, are also of metal construction. The main spars are girders with zig-zag webs formed by short lattice bars of Duralumin, stamped out of the sheet and corrugated to withstand compressive loads, somewhat after the fashion of those used in Zeppelin airships. There is, however, this difference that the lattice bars do not cross one another, but form zig-zag lines instead of a series of crosses. The lattice bars are in duplicate, that is to say, two are in line and placed back to back. The spar flanges



The Breguet "Sesquiplan," type "19 A. 2," is a "Grande Reconnaissance" two-seater fighter, constructed of metal throughout except for the wing covering.

which is to be a large commercial machine with engines on the wings. There is also an older type of machine, similar to those familiar to visitors to Croydon, and the fuselage

are of flat sheet Duralumin and riveted to the lattices, via angle or L-strips. It is somewhat doubtful whether this form of construction utilises the metal to the best advantage,



Front portion of the fuselage of the all-metal Breguet "Leviathan."

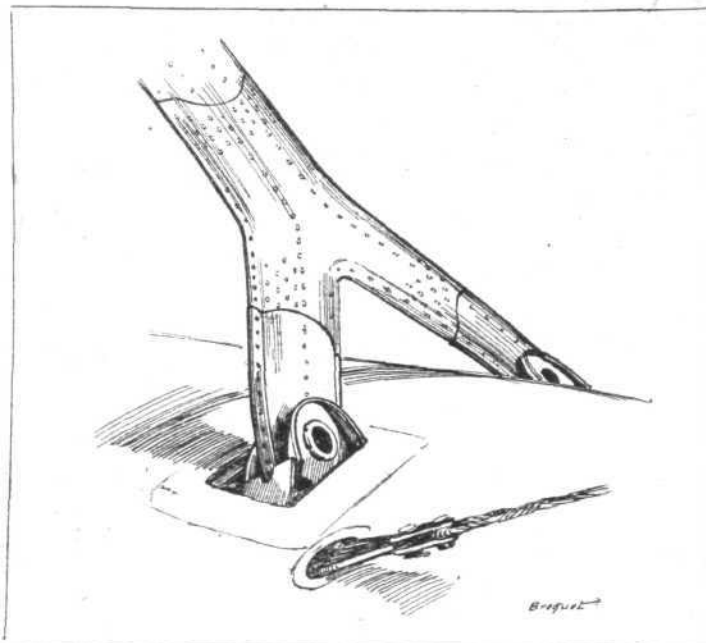
the flat flanges probably having a tendency to fail in compression owing to secondary flexure before the full strength of the metal has been developed. At any rate this has been found to be the case with steel, and although thicker metal can be used owing to the smaller weight of Duralumin, it seems probable that the same principles will hold good. Some form of corrugated spar flanges would probably have been an improvement.

The wing ribs are of somewhat similar construction, but their flanges are in the form of open flanged tubes to which the lattice bars are riveted. The interplane struts are in the form of channel-section compression members enclosed in metal casings. There is only one strut on each side, and where it meets the spars it is forked as shown in the sketch. The wing bracing is unusual in that there are no lift wires between the wings. Cables run from the undercarriage struts to the lower wing spars, and landing wires from the fuselage to the foot of the I-struts. Presumably the object is to interfere as little as possible with the gunner's field of fire.

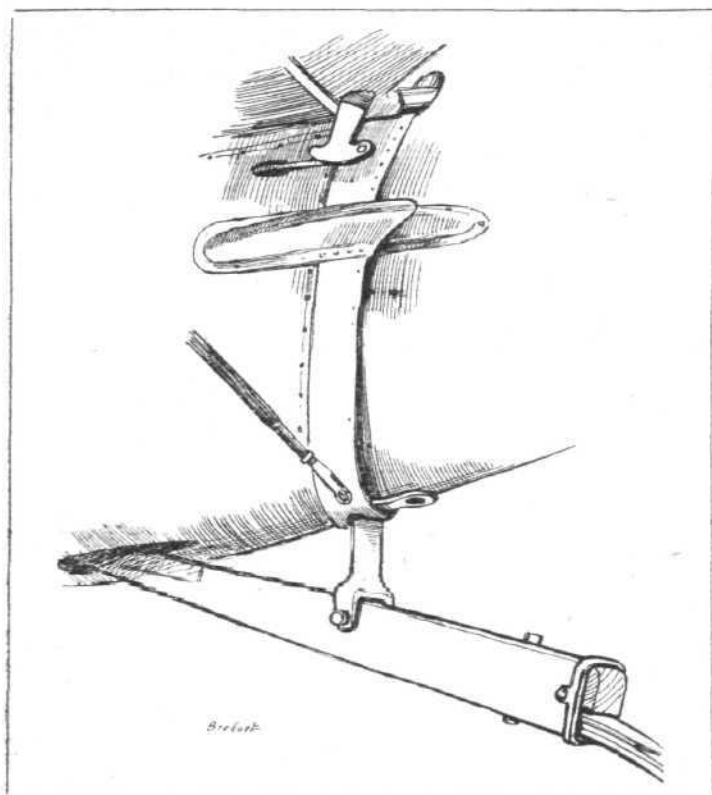
Mounted in the nose of the machine is one of the double, side-by-side vertical Breguet-Bugatti engines, so arranged with automatic clutches, that in case one engine, or rather

possible to state exactly what form of construction will be employed, but it appears probable that it will not differ greatly from that of the "Sesquiplan."

As regards the finished machine, it is understood that it has been "specially studied" with a view to running it on



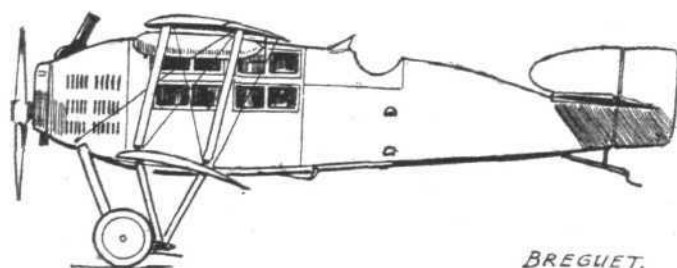
The interplane struts of the Breguet "Sesquiplan," are forked at the ends to meet the two wing spars.



Tail skid, rudder-crank, etc., of the Breguet "Sesquiplan."

the Paris-Marseilles-Algiers and Paris Madrid-Cassablanca routes. If the figures given by the makers are exact—they are probably estimated and not actual figures—the machine will be one of the lightest yet built. Thus, while the weight of the machine empty is given as 3,000 kg. (6,600 lbs.), the load is given as 3,500 kg. (7,700 lbs.). This would appear to indicate a very great saving in structure weight effected by the use of Duralumin construction.

The following are the general characteristics of the "Leviathan," type XXII: Engine, two double Breguet-Bugatti type C.V. of 450 h.p. each; span, 83 ft. 9 ins.; wing area, 1,500 sq. ft.; length, o.a., 46 ft.; height, 16 ft. 4 ins. Dimensions of cabin, length 23 ft.; width, 6 ft. 6 ins.; height, 6 ft. 6 ins. Weight of machine empty, 6,600 lbs.; load, 7,700 lbs.; total weight, 14,300 lbs.; load per sq. ft., 9.53 lbs.; load per h.p., 15.9 lbs. The under carriage is to be of the amphibian type, with twin floats of Duralumin and a small float under the tail.



Side view of the Breguet "14 T bis."

According to the range required the machine carries 20 or 25 passengers, and their luggage. For a range of 600 kilometres (370 miles) *par vent nul*, the number of passengers is 25, while with 20 passengers and more petrol the range is 1,100 km. (680 miles).

A large seaplane float made of Duralumin is also shown by this firm, as well as smaller wing tip floats. The Germans have already made successful use of Duralumin construction for floats, and the metal appears to stand up well to the work, while not, apparently, being affected by the action of sea water, as is ordinary aluminium. A complete metal-covered wing is also shown.

In addition to the machines, Breguet exhibits the Breguet-Bugatti power units which were shown in 1919. These will be referred to later, when we come to deal with engines at the Paris Show.

(To be continued.)

one row of cylinders, cease working, it is automatically de-clutched, and the other engine continues to function. In the nose of the "Leviathan," a double-engine unit comprising two such groups is fitted. The main characteristics of the "19 A.2" are as follows: Engine, Breguet C.V. 450 h.p., or Renault 12 K.B., 450 h.p.; span, upper plane, 48 ft. 9 ins.; span, lower plane, 31 ft. 4 ins.; area, 485 sq. ft.; length o.a., 30 ft. 2 ins.; weight, empty, 2,540 lbs.; crew, fuel, apparatus, and equipment, 1,650 lbs; weight, fully loaded, 4,200 lbs. Speed at ground level, 142 m.p.h.; at 6,500 ft., 139 m.p.h.; at 16,500 ft., 130 m.p.h. Climb to 6,500 ft. in 5 minutes; climb to 16,500 ft. in 15 minutes. Ceiling (theoretical), 26,000 ft.; (practical), 24,300 ft.

As regards the "Leviathan" fuselage shown, this is not an altogether new construction, but has been under way for a couple of years or so. As exhibited, the machine has one of the quadruple Breguet-Bugatti power units mounted in the nose, although from a catalogue and specifications, the machine is represented as having two engines on the wings and none in the fuselage. Whatever form the machine will ultimately take, it is chiefly interesting on account of its all-metal construction. The fuselage has Duralumin tubular longerons, joined by frames built-up of Duralumin lattice-work. The tie-rod bracing runs from the corners of the frames, but auxiliary tubular struts are fitted halfway between the main frames, and the wires cross in the centre of these auxiliary struts. As the machine is shown without wings, it is not

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

COMMITTEE MEETING

A MEETING of the Committee was held on Wednesday, November 16, 1921, when there were present:—Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S., in the Chair, Mr. Ernest C. Bucknall, Lieut.-Col. J. D. Dunville, Col. F. Lindsay Lloyd, C.M.G., C.B.E., Lieut.-Col. F. K. McClean, Lieut.-Col. Alec Ogilvie, Lieut.-Col. M. O'Gorman, C.B., Rear-Admiral Sir Godfrey M. Paine, K.C.B., M.V.O., and the Secretary.

Election of Members.—The following new members were elected:—

Flying Officer E. H. Alliot, R.A.F.
Mrs. Oliver Atkey.
Lieut.-Col. John Dunbar Blyth.
Cyril Ralph Catesby.
Norman Macmillan.
Capt. A. F. Muir.
Reginald Rhodes.
G. B. Segrave.
Henry Wilson.

Fédération Aéronautique Internationale. Madrid Conference.—Lieut.-Col. M. O'Gorman submitted report of the Conference of the F.A.I. held at Madrid on October 26, 27 and 28, 1921.

The Conference was opened by the King and Queen of Spain, and the following countries were represented:—Argentina, Belgium, Brazil, Denmark, Spain, United States, France, Great Britain, Italy, Japan, Holland, and Sweden.

Elections to the F.A.I.—The following countries were elected: China, Chili, Finland, and Austria.

Records for Spherical Balloons.—It was decided that Records for Balloons should be granted in the different categories, according to the cubic capacity, as already laid down.

Aeroplane Height Records.—The existing regulation was altered to do away with the necessity of aeroplanes returning to the point of departure. Recording barographs must always be carried.

Hydro Aeroplane Records.—A separate classification for Hydro Aeroplane Records was approved, and the regulations were left to the Technical Commission to draw up.

Dates for International Competitions.—The proposal of Great Britain that nine months' notice be given of Competitions of an International character, was approved, and it was decided to send out a general recommendation to all clubs.

The following questions were also discussed:—Frontier Maps, Marking and Registration of Balloons, the establishment of the triptyque for foreign travel.

Reports from the International Aeronautical Committees (Technical, Wireless, Medical, Cartographic, and Meteorological) were submitted.

A vote of thanks was passed to Lt.-Col. F. K. McClean and Lt.-Col. M. O'Gorman for attending the Conference on behalf of the Royal Aero Club.

Racing Committee.—Reports of the meetings of the Racing Committee held on November 3 and 8, 1921, were submitted.

Gordon Bennett Balloon Race.—A vote of thanks was passed to Mrs. John Dunville and Mr. E. Allen for representing the Club in the Gordon Bennett Balloon Race at Brussels.

Bronze medals of the Club were awarded to Mr. H. Spencer and Squadron-Leader Baldwin, the pilots of the British Balloons.

RACING COMMITTEE

A MEETING of the Racing Committee was held on Thursday, November 3, 1921, when there were present: Major-General Sir Sefton Brancker, K.C.B., in the Chair, Col. F. Lindsay Lloyd, C.M.G., C.B.E., Lieut.-Col. F. K. McClean.

In attendance: Wing-Commander E. F. Briggs, D.S.O., Major J. H. Ledeboer, Lieut.-Col. M. O'Gorman, C.B., H. E. Perrin, Secretary.

The question of racing next year was generally discussed. Conditions put forward for the Races were considered.

On Tuesday, November 8, the Racing Committee of the Club met the representatives of the Society of British Aircraft Constructors to consider the various questions arising out of the proposed programme of races to be held next year.

CLUB FLYING MACHINES

THE following aeroplanes are now available for use by Members of the Club:—

One B.E. 2e (Two-seater), 90 h.p., R.A.F., and three Avros (Two-seaters), 110 h.p., Le Rhone.

These aeroplanes are at Waddon Aerodrome, Croydon, and the charge is £3 per hour, inclusive of petrol and oil. The Club's representative at the Aerodrome is Capt. A. F. Muir of the Surrey Flying Services.

Members piloting the machines must hold Air Ministry Licence. The Club will make arrangements to supply pilots for the machines in case of Members other than pilots wishing to make flights. There is no restriction as to distance, and flights abroad may be made by arrangement with the Club. Members may also take up their friends.

SERVANTS' CHRISTMAS FUND

THE subscription list for this Fund is now open.

Offices: THE ROYAL AERO CLUB,
3, CLIFFORD STREET, LONDON, W. 1.
H. E. PERRIN, Secretary.

THE LONDON-CONTINENTAL SERVICES

FLIGHTS BETWEEN NOVEMBER 13 AND NOVEMBER 19, INCLUSIVE

Route†	No. of flights*	No. of passengers	No. of flights carrying		No. of journeys completed†	Average flying time	Fastest time made by	Type and (in brackets) Number of each type flying
			Mails	Goods				
Croydon-Paris ...	31	52	9	21	26	3 13	Goliath F-ADDS (2h. 21m.)	B. (4), D.H. 4 (1), D.H. 18 (2), G. (4), H.P. (2), Sp. (6), V. (1).
Paris-Croydon ...	24	59	8	23	22	2 31	D.H. 4 G-EAWH (1h. 54m.)...	B. (3), D.H. 4 (1), D.H. 18 (2), G. (5), H.P. (4), Sp. (4), V. (1).
Croydon-Amsterdam ...	5	5	5	5	4	3 48	D.H. 9 H-NABO (3h. 12m.)...	D.H. 9 (1), F. (2).
Amsterdam-Croydon ...	5	3	5	2	4	3 49	Fokker H-NABJ (3h. 23m.)	F (3).
Totals for week ...	65	119	27	51	56			

* Not including "private" flights.

† Including certain journeys when stops were made *en route*.

‡ Including certain diverted journeys.

Av. = Avro. B. = Breguet. Br. = Bristol. Bt. = B.A.T. D.H. 4 = De Havilland 4, D.H. 9 (etc.).
F. = Fokker. Fa. = Farman F.50. G. = Goliath Farman. H.P. = Handley Page. M. = Martinsyde. N. = Nieuport.
P. = Potez. R. = Rumpler. Sa. = Salmson. Se. = S.E. 5. Sp. = Spad. V. = Vickers Vimy. W. = Westland.

LONDON TERMINAL AERODROME

Monday Evening, November 21.

BAD flying weather has interfered seriously again with the regularity of the Continental air services, and many landings have had to be made at Lympe to await improved conditions. Passengers have fallen off very considerably, and there is much competition for the patronage of those few who are still travelling by air.

On one occasion during the week all the Instone "airliners" were away from Croydon, and the service to Paris had to be abandoned. When this sort of thing happens, it seems generally on a day when there are plenty of passengers—who have, of course, to be disappointed; and then when the machine and the weather are both "O.K." there are often no passengers to be found. All this, though, is in keeping with the general "contrariness" of life, business and otherwise.

The K.L.M. should have run their last machine of the season to Amsterdam on Saturday; but, owing to the weather, they found themselves with three machines and pilots at Croydon on Saturday morning. The weather was reported quite unfit for flying in Holland, but in spite of this Mr. Hinchcliffe, the K.L.M. chief pilot, went off in one of the monoplanes, and was successful in reaching Amsterdam.

The other two pilots, Messrs. Hofstra and Geysendoffer, though quite willing to attempt the journey, were kept at Croydon until today.

To the Winter Sports by Air

ON Saturday the Grands Express began their regular service from Paris to Lausanne, and, in spite of fog on the route, the journey was accomplished in about three hours. The machine returns to Paris from Lausanne today. It is the intention of the Grands Express to run this service every week-end, and passengers can book through from London to Lausanne at a single fare of £14 6s., or £27 for the return journey.

A new map for pilots has been compiled officially by the French, and consists of a strip for the London-Paris route. It is printed in three sections, and has route directions embodied in the map itself. All unnecessary details have been eliminated, and a special feature made of contour markings and of roads and rivers. Aerodromes, emergency landing grounds, and wireless stations are also marked in, and the three sections, when joined together, form a continuous strip map of the route.

Maj. Foot, Capt. Muir, Mr. Piercy and Mr. Courtney have been going to Brussels on Disposal Company's Avros during the week; but, what with weather and other delays, the first two did not leave until Friday. The second pair got off on Saturday, but were compelled to stay the week-end at Lympe.

Mr. Shaw was also to have gone to Brussels, but on Saturday the Instone Air Line found itself a pilot short, and Mr. Shaw piloted one of the D.H. 18's to Paris for them. Prior to leaving, he took the "18" up for a short test, and surprised many people—and alarmed some others—by the slowness of his alighting. Mr. Shaw actually landed this machine at only 28 miles an hour, and it practically pulled up dead.

The Grands Express Fleet

THE Grands Express have had some more new "Goliaths" on their service this last week. I am informed they now have 10 of these machines towards the 12 required by the terms of the French subsidy, and the other two are rapidly nearing completion. These Farman machines are shortly to be added to by a fleet of Vickers "Vimy's" which are to be built in France. The Grands Express have a definite object in view. They do not intend to refuse a single passenger this next summer, though they have had to turn away scores this year. Hence the firm intention to have enough machines for all possible emergencies.

An Official Ignoring of the "Air Express"

MUCH disappointment was felt by the various civil air transport firms when Capt. Guest went to Paris in an R.A.F. machine on Tuesday, rather than by one of the scheduled commercial machines, in which there were plenty of seats available. Then, soon afterwards, as a sort of poetic judgment for this ignoring of the commercial "air expresses," news came through that the machine carrying his luggage had forced-landed, and that while the Secretary of State for Air was in Paris his luggage was "somewhere in France." With the misfortune that overtook Flight-Lieut. J. M. Robb on his return journey from Le Bourget to Kenley, when his engine stopped while over the Channel and he failed to make the shore at Folkestone by 200 yards, this particular official trip to Paris must have cost the taxpayers rather more than the fare by "air express"!

It was intended that the "amphibian" should fetch Capt. Guest back from Paris to London. She was out of the shed having her Napier engine tested, and Capt. Grace, the aerodrome A.I.D. Inspector, went carefully over her to see that everything was quite "O.K." Then, however, for some unknown reason, this idea was abandoned.

After a period of hesitation, the Sports Club has now got football going. Two matches have been played, and a knock-out competition for six a side teams is being arranged, after the style of the cricket competition that was so successful this last summer. The Napier engine people are presenting a cup for the winners of this competition.

ROYAL AERONAUTICAL SOCIETY NOTICES



Next Lecture.—On December 1st, at 5.30 p.m., Major G. H. Scott, C.B.E., A.F.C., will read a paper on "The Present State of Airship Development," at the Royal Society of Arts.

Technical Discussions.—It has been decided to hold from time to time, technical meetings in the Society's Library for the purpose of discussing scientific papers of a more intricate character than those which are suitable for the Society's Lecture programme. Any paper submitted will first be considered by the Library and Publications Committee, when, if approved, a date will be fixed for their discussion. A limited number of advance proofs will be prepared and distributed only to members who apply for them, or invited guests. The meetings will consist of discussion only on the assumption that the paper has been previously read by all present. The papers may subsequently be published in the *Journal*, together with the discussions thereon, each individual forwarding his contribution to the Secretary in writing for this purpose.

Memorial Lectures.—In addition to the Wilbur Wright Memorial Lecture, which was constituted in 1912, and for which a capital sum exists in the hands of Trustees sufficient to pay an annual fee of £50, a Fund has lately been raised

by private subscription to provide a small fee for an annual lecture in memory of the late Wing-Commander Nevill Osborne, who played so important a part in the early development of British airships. It is proposed to hold the first Osborne Memorial Lecture in 1922.

Students' Discussion Meetings.—At the second monthly meeting on November 10, Mr. W. L. Le Page read a paper on "The Soaring Flight Problem," when Mr. F. Handley Page, Fellow, took the Chair. These meetings are confined to Student Members of the Society and their friends, and at the end of the Session the Pilcher Memorial Prize will be awarded to the paper inaugurating discussion at one of these meetings which is judged by the Council to be the best. The next meeting takes place on December 8, when Mr. Colin Daniel, will read a paper on "Practical Points in Fuselage Construction."

Donations.—The Council acknowledges, with grateful thanks, the gift of the following books from Air-Commodore Brooke-Popham on vacating the Chair:—"Manual of Meteorology, Part IV," by Sir Napier Shaw; "The Gas, Petrol and Oil Engine," by D. Clerk and G. A. Burls; "The Heat Treatment of Tool Steel," by H. Brearley; "Thermodynamics for Engineers," by J. A. Ewing; "Theory of Structures," by A. Morley.

W. LOCKWOOD MARSH, Secretary

Suspension of London-Amsterdam Air Service

THE Postmaster-General announced that on and from November 19, the air mail service between London and Amsterdam has been suspended.

"Roma" Redivivus.

THE airship "Roma," purchased from Italy by the U.S. Government, is being erected, but is not expected to be ready before early next year.

BRITISH AIRCRAFT ACCESSORIES

IN the two previous issues of *FLIGHT*, that part of the British Aircraft Industry formed by the aircraft manufacturers and aero engine manufacturers has been briefly dealt with, so as to give in a short review a *résumé* of the industry, as it actually exists today. In the following notes, we have compiled what may be termed an introduction to the British firms who manufacture and sell materials, accessories, etc., for aircraft and aircraft engines. In the space available it has been found impossible to enumerate all the various articles or materials handled by the different firms. To do so adequately would require a large volume, but it is hoped that the few words of introduction will, at any rate, serve to give our readers, and especially our foreign readers, a fair idea of the nature of the business done by the various firms.—ED.

The Aerograph Co., Ltd.,

43, Holborn Viaduct, London, E.C. 1.

PAINTING, varnishing and doping are by no means unimportant items in aircraft construction, and call for much care and attention in their application. The Aerograph Co., who are pioneers in the spraying method of applying paints, etc., have produced special instruments and plant for use in connection with aircraft construction. It may be pointed out that this method of applying paint, varnish, or dope not only has the advantage of saving labour, but it enables the job to be effected with an extraordinary amount of control, as compared with the ordinary brush method, so that the paint, etc., is delivered evenly and continuously, it does not drag the surface of the object to which the medium is applied, and it is economic with the medium. The Aerograph Co. offer a full range of instruments to suit all kinds of work. These instruments are operated by compressed air, which is supplied by portable plants of various sizes, or by larger, permanent plants.

The Aeronautical and Panel Ply-wood Co.,

218-226, Kingsland Road, London, E. 2.

PLYWOOD, in various forms, is being utilised more and more by modern aircraft designers, and it undoubtedly has great possibilities in this connection owing to its comparative strength and lightness. Its manufacture, however, calls for more than ordinary attention when it is intended for use in aircraft, and the wood must be specially selected and built up with the utmost care. The Aeronautical and Panel Plywood Co. have made a special study of the various requirements plywood has to fulfil in aircraft construction, and can supply this material to suit all kinds of work in this connection.

The Aircraft Disposal Co., Ltd.,

Regent House, Kingsway, London, W.C. 2.

THE "A.D.C." was formed to take over from the Government, and to dispose to the public, the vast quantity of aircraft and aircraft material that was "left over" from our "War Stock." The material handled by the A.D.C. is as varied as it is immense in quantity—and as to quality, it is of British construction. It ranges from complete aeroplanes—of some of our best types—down to split-pins, and includes engines of various makes, instruments, and fittings. A complete list of these is out of the question here.

Allen-Liversidge, Ltd.,

106, Victoria Street, London, S.W. 1.

THIS firm, which is amalgamated with Imperial Light, Ltd., specialises in acetylene welding plant and blow-pipes, and in night landing lights for

aerodromes—both of which play an important part in aviation. In connection with the night landing lights, they have carried out much experimental work, and have produced several successful schemes.

The Anglo-American Oil Co., Ltd. (Pratt's),

Queen Anne's Gate, London, S.W. 1.

ALL grades of petroleum spirits are handled by this firm, including the well-known "Pratt's" Aviation. They also specialise in bulk storage outfits, suitable for use on aerodromes, which consist of an underground storage tank connected up with a self-measuring pump.

Auster, Ltd.,

133, Long Acre, London, W.C. 2, and Birmingham.

IN the automobile world Auster wind-shields have achieved a distinct reputation for efficiency and good design. Messrs. Auster also make wind-shields for use on aircraft, and as may be expected these are equally efficient in design. They are of sound construction and an effort has been made to produce a design which will provide the maximum amount of protection, yet at the same time offer the least possible head resistance. They are fitted with Triplex un-splinterable glass.

Barimar, Ltd.,

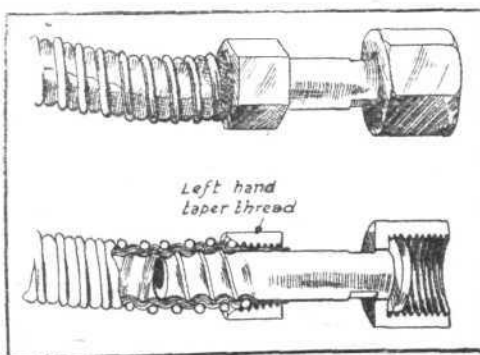
10, Poland Street, London, W. 1.

WELDING repairs of every description are undertaken by Messrs. Barimar, Ltd., and we are not exaggerating when we say that they have brought such work up to a wonderful stage of perfection. Articles, such as crank-cases, cylinders, etc., when broken as it would seem beyond repair, when sent to Barimar's are returned, in nearly every case, repaired almost good as new. They have, in fact, brought welding repairs to a fine art.

The Blaisdell Petrol-Flex Co., Ltd.,

Cassibury Works, Watford.

A SPECIAL form of flexible tubing, for aero-engine petrol systems, has been evolved by this company, with the object of eliminating the various troubles associated with copper and rubber tubing when used for this



The Blaisdell flexible, petrol-proof tubing.

purpose. The principal feature of the Blaisdell tubing (see *FLIGHT*, September 15, 1921) is that it is really petrol- and benzol-proof, as well as petrol-benzol-resisting. It consists of an inner lining of several layers of animal gut, covered with an outer layer of fabric, the whole being strengthened by a wire wound spirally around the tube. A special form of union has also been designed for use with this tubing.

The British Aluminium Co., Ltd.,

109, Queen Victoria Street, London, E.C. 4.

ALUMINIUM in all forms is supplied by this firm, including ingots, sheet, circles, tubes, and a large variety of sections. They have also issued a series of very interesting and useful booklets containing hints on working aluminium, in all the above forms, which should be of considerable help to aircraft constructors.

The British Emaillite Co., Ltd.,

30, Regent Street, London, S.W. 1.

THE products of the British Emaillite Co. consist of the following:—Aero-plane dopes, including "X" for use on aeroplanes and seaplanes for tropical service, "B" for standard type machines, "S.M." for school and training aeroplanes, and "P" for airships; protective materials, "T.O.V." transparent and "P.V.O." in various colours; wood varnishes (internal and external work), enamels, paints, and varnishes.

The British Thomson-Houston Co., Ltd.,

Rugby.

THIS well-known electrical house have produced several magnetos specially for use on aircraft engines, the most popular of which are the "A.V. 12," the "A.O.9" and the "A.V.8." The former was used on the "R.34" during its double Atlantic crossing. These magnetos are of the polar-inductor type.

Brown Bros., Ltd.,

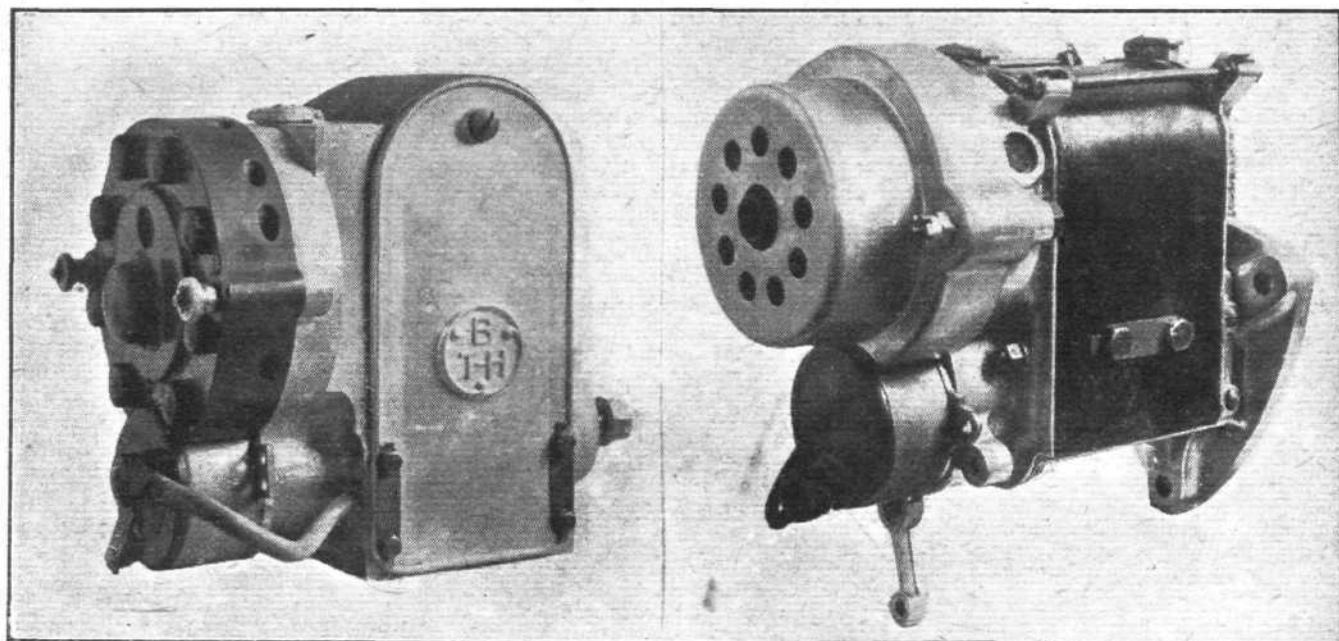
Great Eastern Street, London, E.C. 2.

THE aviation branch of Messrs. Brown Bros.' business is as complete as their motor-car, motor-cycle, and cycle sections—and that is saying a great deal. In addition to such important accessories as every kind of instrument—aneroids, air speed, rev. counters, compasses, gauges, release valves, etc.—and various aircraft fittings, Brown Bros. supply electrically heated clothing, various patterns of helmets, goggles, and safety belts. We may also mention, amongst the other million-and-one things are: Control wheels and levers, carburettors, lighting dynamos, lamps, sparking plugs, pumps, airscrews, petrol taps and unions, shock absorbers, and all kinds of metal parts and fittings.

Bruntons,

Musselburgh, Scotland.

STREAMLINE wires form the principal speciality offered by Bruntons, and it



Two B.T.H. (polar inductor) magnetos, the A.V. 8 (left) and the A. O. 9 (right).

should be noted that this form of wire, with its several advantages, is coming more and more into general use. They also manufacture tie-rods, universal and plain fork joints, trunnions, lock-nuts, pins, locking plates, turn-buckles, and steel wire cables for aircraft.

Bullivants, Ltd.,

72, Mark Lane, London, E.C. 3.

WIRES and cables of various kinds are manufactured by Bullivants, Ltd., including the following for use in connection with aircraft. Round steel wire, flat steel wire rope and round steel wire strands, four-stranded control cable, etc.

E. R. Calthrop's Aerial Patents, Ltd.,

423A, Edgware Rd., London, E.C. 2.

THE "Guardian Angel" parachute, designed by Mr. E. R. Calthrop, is well known in the world of aeronautics, and needs no description here—and even so, to give a description, however brief, requires much technical matter for which we have not the space in this issue. Suffice it to say the "Guardian Angel" is of the automatic or positive type parachute,

and that it has demonstrated its reliability very satisfactorily for some time past.

Cellon (Richmond), Ltd.,

22, Cork Street, London, W. 1.

CELLON dope for aeroplane fabrics has been in existence since the early days of flying—1911—and during the interval between then and now has steadily been gaining popularity. Perhaps the best known Cellon dope is the type "B," a pigmented dope which can be obtained in a variety of colours. Other Cellon specialties consist of "dopes" for wood (to replace French polish) for metal (in the form of a lacquer), and for leather, paper, and other substances, and various varnishes.

Charles Clifford & Son, Ltd.,

Birmingham.

THE principal products of this firm are as follows: Die castings, sand castings, copper and brass in rods, tubes, sheet and wire, phosphor bronze and gunmetal, wires and cables.

R. W. Coan,

219, Goswell Road, London, E.C. 1.

COAN's clean castings can certainly claim considerable commendation. Communicate with Coan, or call, to

collect comprehensive catalogue of castings.

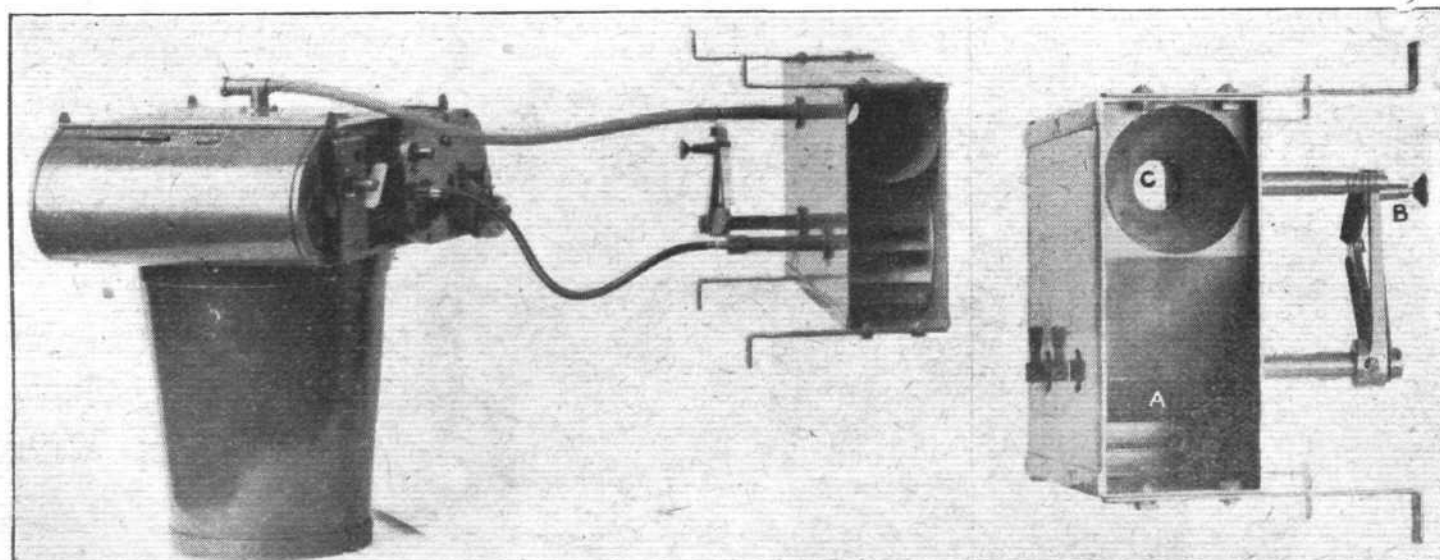
The Falcon Airscrew Co.,

113, Cottenham Road, London, N. 19.

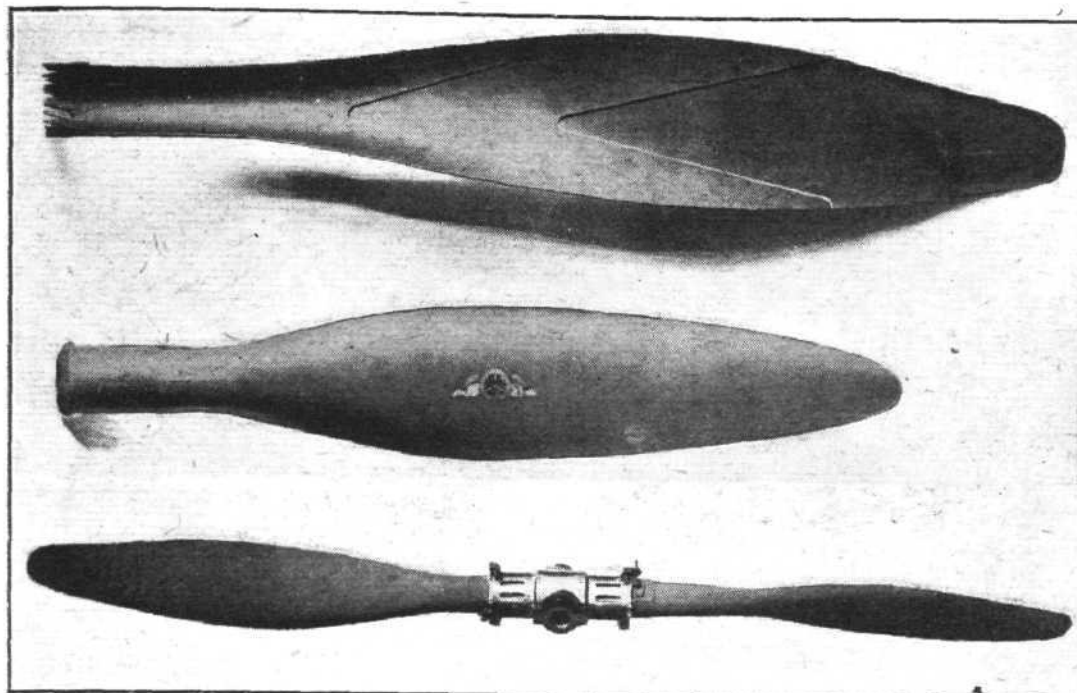
AIRSCREWS of all types, built up from the best selected wood, are produced by this firm, who have a well-equipped factory with a large staff of highly-skilled wood-craftsmen, for this purpose. They are making a special feature of three-bladed airscrews—a most difficult piece of construction.

The Gas Accumulator Co. (U.K.), Ltd.

DESIGNERS and manufacturers, of many years standing, of Marine Lighthouses, this firm have recently taken up the question of aerial lighthouses, into which they have gone very thoroughly and done a great deal of experimental work. They have already produced several schemes—still more or less undeveloped—relating to aerial beacons, etc., that give promise of every success. The A.G.A. lighthouses are noteworthy in being absolutely automatic in action and in requiring no attention for long periods.



The Kodak automatic aerial camera (roll film) for mosaic work.



The Leitner-Watts all-metal airscrew. The top view, showing the interior of a blade, and below a finished blade, and the complete airscrew.

Imber Anti-Fire Tanks, Ltd.,

West Road, London, N. 17.

THE Imber petrol tank, which was used on many of the R.A.F. machines during the War, possesses the following very valuable features. It is self-sealing, so that in the event of a bullet, etc., piercing the tank the holes are immediately closed and a leakage of petrol prevented. It will not break or burst in the event of a crash, thus greatly minimising the danger of fire.

Kodak, Ltd.

Kingsway, London, W.C. 2.

THE name of Kodak in connection with photography is, of course, well known to all, and as may be expected the importance of aerial photography has been recognised in the production of several Kodaks designed specially for this work. The principal models comprise the following:—A-1 hand-held for plates (5 × 4 ins.); B-1 similar, but for roll films; C-2 hand-operated, mosaic-mapping type for plates (5 × 4 ins.); and the K-1 an automatic (wind-motor) roll film (18 × 24 cm.).

Lodge Plugs, Ltd.,

Rugby.

It is quite unnecessary to dwell at length on the products of this firm, as Lodge sparking plugs have held a position in the front ranks for many years past. Suffice it to say that special attention has been given to plugs for use on aero engines of all types.

J. MacLennan and Co.,

115, Newgate Street, E.C. 1.

This company manufactures such necessary components in the construction of aircraft as fabrics, yarns, insulating materials, tapes and webbing.

Marconi's Wireless Telegraph Co., Ltd.,

Marconi House, Strand, W.C. 2.

THE wireless equipment (telegraph and telephone) of aircraft is such an important item—on military and commercial machines at all events—that it is really more than an accessory. It should really form a component part of the machine equally with the engine. Needless to say, therefore, the Marconi Co. have devoted a considerable amount of attention to the application

of W.T. to aircraft and are able to supply all wants in this direction.

The Metal Airscrew Co., Ltd.,

Regent House, Kingsway, W.C. 2.

THE advantages offered by the all-metal airscrew has tempted several firms to undertake the difficult task of solving the many problems relating to the production of this type, with varying degrees of success. To the Metal Airscrew Co. this success would appear to be well within their grasp, thanks to the collaboration and years of investigation of Mr. Leitner and Dr. H. C. Watts. It is impossible to describe the constructional features of the Leitner-Watts metal airscrew here, and we would refer our readers to an article on the same which appeared in *FLIGHT* for December 30 last. However, the tests made with the recent models have given very satisfactory results.

The Midland Fan Co., Ltd.,

Birmingham.

IN addition to various types of spray painting plants—which include doping—the Midland Fan Co. also undertake heating, dust-removing, and ventilating schemes for workshops, aircraft factories, etc.

Naylor Bros., Ltd.,

Slough.

THIS is an old-established firm having a specialised knowledge of all matters appertaining to paints and varnishes, and the requirements of the aircraft industry in this respect have received special attention.

Joseph Owen and Son,

Borough High St., London, S.E.

OF the raw materials used in present-day aircraft construction, wood undoubtedly plays the most important part. Furthermore, it is essential that the wood used be of certain kinds—spruce, ash, mahogany, and walnut being the principal kinds employed—and that it is of the highest quality. Joseph Owen and Son have for some considerable time past made a feature of holding large stocks of specially selected woods for aircraft requirements.

Palmer Tyre, Ltd.,

Shaftesbury Avenue, W.C. 2.

THE tyres used on aeroplanes, though in actual use for only a short

period of the aeroplane's progress, call for no ordinary requirements—such as landing at high speed on bad ground, great strength combined with lightness, etc. The wide experience of the Palmer Tyre Co. has enabled them to produce tyres specially designed for aircraft that have achieved a world-wide reputation. Palmer aero tyres are made in all sizes to suit all types.

The Robinhood Engineering Works, Ltd.,

Putney Vale, London, S.W. 13.

THE Robinhood Engineering Works are the makers of the famous K.L.G. sparking plugs, which have not only made their name in the motoring world, but have come very much to the fore in matters aviation. K.L.G. plugs were used on the "R.34's" double Atlantic flight, Alcock's Atlantic flight, the London-Australia, and the Cape to Cairo flights. Various models of K.L.G. plugs are made to suit all requirements.



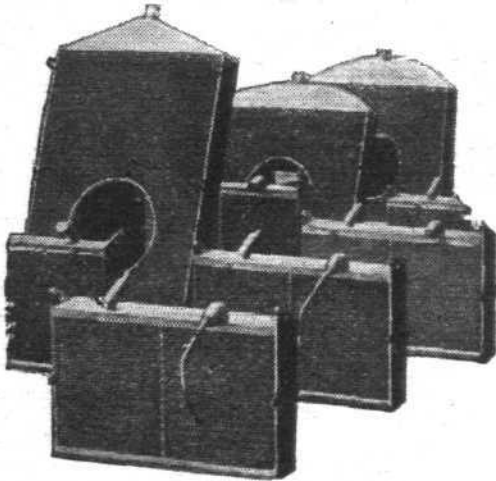
The K.L.G. Aviation Plug

Rubery, Owen and Co.
Darlaston, Staffs.

APART from the full range of aeroplane fittings, such as A.G.S. turn-buckles, eye-bolts, bolts and nuts, etc., Rubery, Owen make a special feature of pressed steelwork for aircraft, including all-steel spars, ribs and struts, and corrugated steel parts.

Serck Radiators, Ltd.,
Greet, Birmingham.

In addition to various types of radiators for aircraft, sundry copper and brass tube work is turned out from the very extensive works of the above firm.



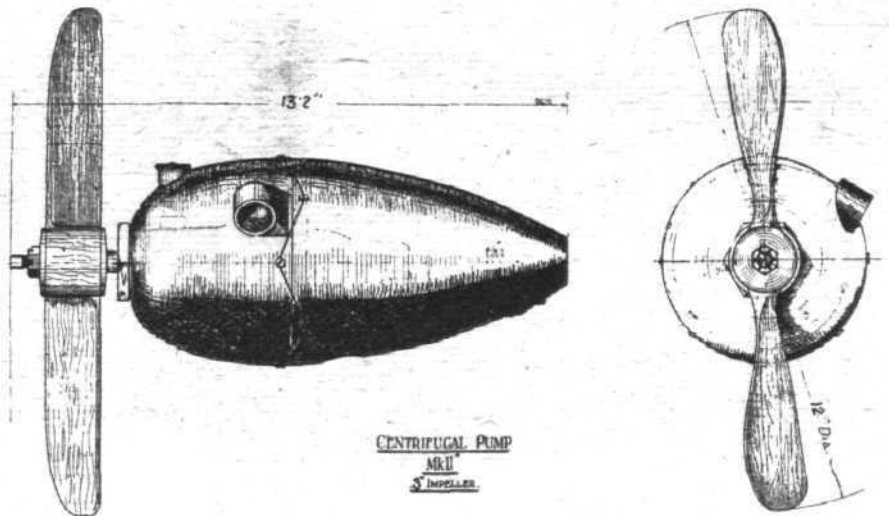
A group of Serck radiators.

Shell-Mex, Ltd.,
Victory House, Kingsway, London, W.C. 2.

A LIST of the numerous aviation records won on "Shell" should be sufficient to indicate the excellent qualities of this popular fuel. Like its brother "spirit," J.W., it is "still going strong."

S. Smith and Sons (M.A.), Ltd.,
Great Portland Street, London, W. 1.

THE aviation section of this well-known accessory firm is well represented by a full range of instruments, amongst which special mention may be made of the following: The Smith boiling-point altimeter, which not only indicates height, but has in addition a series of red-figures which show the boiling-point of water at various altitudes, thus allowing a check to be made on the radiator thermometer; oil pressure gauges; density meter (checking the ordinary air speed indicator); recording air speed

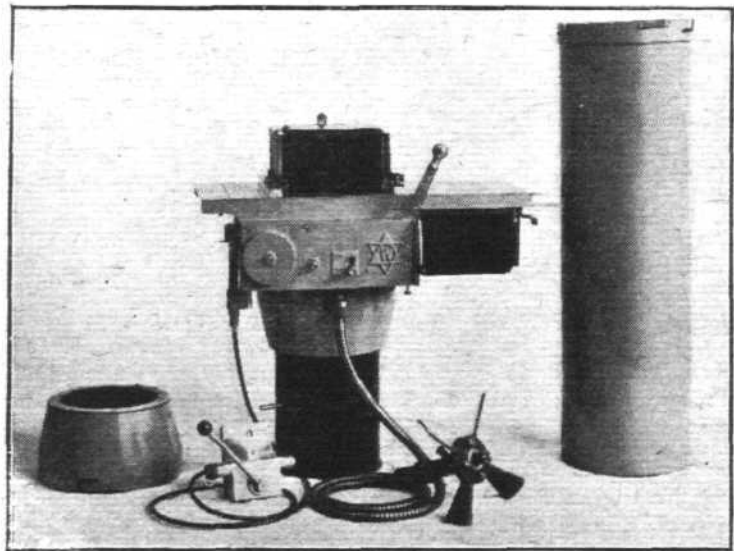


The Vickers centrifugal, air-driven, petrol pump.

indicator; petrol level gauge (indicating level of petrol in tank); and Hughes' compasses. They also supply various other aero accessories such as complete instrument boards, magnetos, and K.L.G. plugs.

cluding khaki pigmented oil varnish, transparent oil varnish, white dope resisting paint, etc.

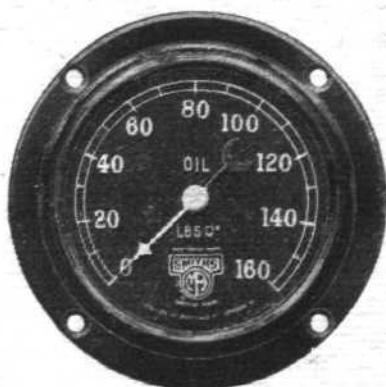
C. A. Vandervell and Co., Ltd.,
Acton, London, W. 3.
The electrical productions of Messrs.



The Williamson "L.B." automatic aero-camera.

Titanine, Ltd.,
175, Piccadilly, London, W. 1.
THE makers of "Titanine" non-poisonous dope, which, it is claimed, possesses remarkable flame-resisting properties. They also manufacture various "finishing" materials, in-

C. A. Vandervell hold a record of reliability and efficiency over a period of a good many years now, and their works at Acton are one of the largest of its kind in this country. Their dynamo lighting sets are world-famous, and their engine starting sets have also proved their worth. Most of the electrical requirements of aviation are supplied by "C.A.V."



Three useful "Smith" instruments. On the left, an oil pressure gauge, in the centre a "boiling-point" indicator, and on the right an air density meter.

Vickers, Ltd.,

Vickers House, Westminster, London, S.W. 1.

IN addition to the design and construction of complete aircraft, Messrs. Vickers have also turned their attention to the supply of accessories for the same. Perhaps the best known of these is "Duralumin," an aluminium alloy possessing remarkable properties, and produced in almost every form. Other "lines" include the Reid Control Indicator (described in *FLIGHT* for November 10 last); a very complete range of fittings appertaining to the petrol system (including wind-driven centrifugal pumps, hand pumps, relief and by-pass valves, petrol cocks, petrol flow indicators, non-return valves, etc.); and com-

plete equipments for signals in connection with aerial navigation.

The Victoria Rubber Co., Ltd.,
Edinburgh.

THE above manufacture fabrics for use in connection with aircraft, especially rubber-proofed for airship use.

C. C. Wakefield and Co., Ltd.,
Cheapside, London, E.C. 2.

THE wants of the aero engine as regards lubricating oils have been looked after very well indeed by C. C. Wakefield and Co., and various brands of "Castrol" are available to suit all conditions. Castrol has assisted aviation—and not British aviation alone—in securing a very large proportion of the world's records.

The Williamson Kinematograph Co.,

Willesden Green, London, N.W.

THE above firm are the makers of the "L.B." aero-camera, which achieved some considerable success during the latter stages of the War. The "L.B." aero-camera is of the combined hand and windmill operated type.

The Yorkshire Steel Co., Ltd.,

30, Holborn, London, E.C. 1.

THE principal aeronautical speciality of this firm consists of the Holt "Autochute" life-saving parachute. They are also responsible for landing lights, parachute flares, mail-dropping devices, etc., and also "Ora" anti-friction metal for aero engines.



THAT was an exhilarating aviation story told the other day by the *Daily Chronicle* Paris correspondent, of an attempt by a French aviation officer to abduct a nun from the Carmelite Convent at Marienthal.

It is said, so the story runs, that the officer, who belongs to one of the best families in France, fell in love with the pretty nun, whom he first saw while flying over the convent garden.

On another aerial visit he dropped her a note saying he would marry her if she consented to renounce her vows. She did not reply, but was always in the garden when the officer flew over the convent.

Later, therefore, escorted by two comrades, the aviation officer coolly went to the nunnery and exhibited papers bearing official seals demanding that the young nun be handed over to the visitors.

She, however, refused to leave.

The trio of airmen, it is stated, retired in confusion, and are now under arrest.

Some eyesight!

CURIOUS what different hobbies are often indulged in by burglars and other expert free lances. The "expenses account" of the New York safe robber, who by reason of the "call of the air" took up that profession to enable him to gratify his passion for acquiring aeroplanes, surely tops the bill. The airy items of this gentleman of the dark lantern are said to have included the following:—

One aeroplane, £2,000; one aeroplane, £1,200; one aeroplane, £1,000; one aeroplane, without motor, £400; one aeroplane motor, £900; installing motor, £100; organising aeroplane company, £300; jewellery for wife, £600; living and travelling expenses, £3,500.

ANOTHER from America.—Mr. John Barth, the American insurance actuary, an admitted expert in interpreting mortality tables, has figured out that the average length of life for the last fifty years has increased by 10, and there is every indication that an equal amount will be added in the next half-century. Mr. Barth, who put his theory before the convention of insurance companies at Chicago the other day, said that the life pinnacle is now 75 instead of 68, and it is no idle dream to predict 300 years as the ultimate goal of man's longevity. People who scorned such an idea were probably the same people who ridiculed the idea of man flying. According to the Health Conservation Committee of the Chicago Convention, dietotherapy now takes its place with hydrotherapy, electrotherapy, and all the other herapies of scientific knowledge. It is the science of eating wisely and well at regular hours, and the avoidance of nibbling between meals. The list of foods recommended include milk, cooked bran, and salad oil.

FLYING, anyway, is very much an accomplished fact. But from the last sentence we've serious doubts whether the 300-year longevity stunt is worth following up, even if it would peeve the eighteenth-century scoffers at aviation.

THAT was a smart bit of work by some Bank official, who had the sense of imagination in regard to aviation, recently referred to in the press. Last year, it appears, a fraud was perpetrated from Paris on the London office of a Portuguese bank, and imprisonment of the culprit has recently resulted, the discovery of the crime being due to the quick action of the London Office of the bank concerned. This quick action was that of having letters that arrived in this country, addressed to various bankers, photographed and sent by aeroplane to Paris. This led to the immediate identification of the culprit and the ultimate recovery of the money.



At Cape Town the A.C. of South Africa is doing very good practical work to keep up their end in aviation against many handicaps. They also see to the side which inspires respect for those who have, in the air, done their duty to the Empire. Above is a beautiful monument erected by the Club to the memory of the late Capt. A. S. Hemming, D.F.C., the stonework and propeller being cut out of local granite. In addition, the Club is preparing a suitable parchment scroll to present to the parents of the late Capt. Proctor, V.C., who was a member of the Club.

NOTICES TO AIRMEN

France : Military Aerodromes ; St. Inglevert, etc.

1. *Use of Military Aerodromes, etc.*—A list has been issued of military or naval aerodromes and seaplane stations available for use by civil aircraft in cases of emergency only, i.e., when pilots are unable to reach a civil air station.

In the case of those marked with an asterisk, thus *, which are joint military and civil aerodromes, pilots should land preferably on the portions reserved for civil use, and should then proceed towards the civil hangars and control offices.

Assistance can only be given by the French military authorities in exceptional circumstances, and in all cases only so far as the personnel and material available permit.

(i) *Aerodromes.*—Aulnat, Avord, Bitche, Cazeaux, Chateau-Roux (La Martinerie), Colmar, *Dijon (Longvic), Digneville, Douai (La Brayelle), Etampes, Frescaty, Haguenau, Istres, La Perthe, *Le Bourget, *Le Bron (Lyons), Le Val-Dahon, Luxeuil, Malzeville, Ochey, Pau, Romilly-sur-Seine, Romorantin (Pruniers), Saint Cyr, Saint Dizier, Saint Raphael, Sommesous, *Strasbourg (Neuhof), Thionville (Basse-Yutz), Toul, Tours, Villacoublay, Villeneuve-les-Vertus.

(ii) *Seaplane Stations.*—Berre, Brest, Cazeaux, Cherbourg, Hourtin, Saint Raphael.

(Particulars are given on the notice of Geographical and Local position, accommodation, etc.)

2. *Telephone Numbers.*—The telephone numbers of the Ajaccio and Orleans air stations are :—Ajaccio, 87 : Orleans, Aydes, No. 17.

3. *Previous Notices.*—The following Notices to Airmen are cancelled :—

By Para. 1 :—Para. 1 ("Military Stations," Page 4) of No. 98 of 1920, No. 6 of 1921, and para. 3 (1) of No. 68 of 1921.

By Para. 3 :—No. 71 of 1921.

The following is amplified :—By Para. 2 :—Para. 3 of No. 36 of 1921.

(No. 97 of 1921.)

France : Position of Le Bourget Lighthouse Changed

NOTICE to Airmen No. 98 of 1920 (Section 1, Aerodromes : Le Bourget) is amended as follows :—

The lighthouse on Le Bourget aerodrome which was situated on the south side of the aerodrome has now been moved to the N.E. corner in the angle between the Route de Flandres and the Morée brook.

(No. 98 of 1921.)

Switzerland : Geneva Customs Aerodrome and Seaplane Station

THE following information amends and amplifies previous Notices to Airmen relating to Switzerland :—

1. Customs Aerodrome.

Geneva (Cointrin) Civil Customs Aerodrome, under the control of the Public Works Department, Geneva.

Position.—Latitude 46° 14' 0" N., Longitude 6° 6' 0" E. Situated 4½ kms. N.W. of Geneva on the north side of the Geneva-Lyons road and 1½ kms. N.E. of the village of Vernier.

Description.—Dimensions for landing, 1,000 metres (N.E. to S.W.) × 550 metres (N.W. to S.E.). Altitude 1,430 ft. Surface hard and dry, slightly sloping from the centre to all sides. Hangars, buildings and high tension electric cable and the village of Cointrin on the S.E. side. Work in progress on the N.W. side. The Jura mountains (5,600 ft.) lie to the W., at a distance of about 5 kms.

Accommodation, etc.—Four hangars, each 52 ft. (approx.) wide and one open shelter, 102 ft. wide. Facilities for small repairs. Large supplies of petrol and oil.

Signals and Markings.—Near the centre of the ground is a large white circle, 50 metres in diameter, on which the north point is indicated. The name "GENEVE" is marked in large white letters in the middle of the S.E. side, and the following other signals, with the exception of the landing arrow, are situated close by :—

A Wind indicator in the form of a pennon or wind sleeve is displayed on a signal mast. Other signals on this mast are for the use of the ground staff and should be ignored by pilots.

The strength of the wind is indicated by three triangular signs on the ground showing either red, or white faces, to be read as follows :—

White, white, white—Very light wind.

White, red, white—Moderate wind.

Red, white, red—Strong wind.

Red, red, red—Very strong wind (hurricane).

The direction of the prevailing wind is N.E., i.e. roughly parallel to the longer sides of the aerodrome. The portion of the aerodrome to be used for landing is indicated by three

rectangular signs, placed side by side, showing white or red faces. The aerodrome is assumed to be divided lengthways into three parallel and equal strips and each sign represents that strip of the aerodrome with which its position corresponds. A white panel indicates that landing is permitted and red that it is prohibited. Thus, when the panels shown are white, red, white, landing may take place on each side but not on the middle of the aerodrome.

In addition a large white arrow is also placed, when necessary, on that part of the aerodrome to be used for landing. The arrow points into the wind.

The direction in which machines should turn when in the vicinity of the aerodrome is indicated by a white or red disc, white indicating a turn to the right and red a turn to the left.

Telegraph and Telephone.—Telegraphic address : "Aerodrome, Genève." Telephone No. : Mont Blanc 4600 (Genève.)

2. Customs Seaplane Station.

Geneva (Eaux Vives). There is one small hangar in addition to the slipway at this station.

3. Previous Notices.

Notice to Airmen No. 41 of 1921, Para. 2 (Cointrin), is cancelled by Para. 1 of this Notice.

Notice to Airmen No. 117 of 1920, Para. 2 (b) (Eaux Vives), is amplified by Para. 2 of this Notice.

(No. 99 of 1921.)

Temporary Closing of Castle Bromwich and Didsbury Wireless Stations

It is notified that the W/T and R/T stations situated on the aerodromes at Castle Bromwich (Birmingham) and Didsbury (Manchester) will, as from Tuesday, 15th instant, and until further notice, be temporarily closed for traffic, and the meteorological reports hitherto transmitted to the Air Ministry will be discontinued.

(No. 100 of 1921.)

Securing of Ballast and Loose Articles carried in Aircraft.

ATTENTION is drawn to the necessity of ensuring that ballast, personal luggage and other loose articles carried in aircraft in such a position that movement might cause them to fall out during flight, or to interfere with or foul the controls, should be properly secured before flight commences.

Cushions in the pilot's, mechanic's or passengers' seats should be so fixed that they cannot fall out or slip forward. It is recommended that, in cases where the standard cushion is not suitable for an individual pilot, a special cushion should be provided in preference to using several cushions that cannot readily be secured to the seat.

Passengers should be warned that it is exceedingly dangerous to drop any article from an aircraft in flight, and that any person contravening the Air Navigation Regulations in this respect is liable to six months' imprisonment or a fine of £200 or to both such imprisonment and fine.

(No. 101 of 1921.)

France : Marine Lighthouses

1. The following marine lighthouses on the French N.W. coast have now been unmasked to landward, in addition to those given in Notice to Airmen No. 68 of 1921.

(a) *Dunkerque.* Lat. 51° 03' N., Long. 2° 22' E. Near the W. jetty. A white, group, flashing light, period 10 seconds, is exhibited from a white cylindrical tower on a rectangular base at a height of 193 ft. above high water. Visibility, 20 miles.

Characteristics. :—Flash, 0.1 sec.; Eclipse, 2.4 secs.; Flash, 0.1 sec.; Eclipse, 7.4 secs.

(b) *Calais.* Lat. 50° 58' N., Long. 1° 51' E. On the N.E. side of the town. A white, group, flashing light, period 15 seconds, is exhibited from a yellow and white octagonal tower at a height of 190 ft. above high water. Visibility, 20 miles.

Characteristics. :—Flash, ½ sec.; Eclipse, 2 secs.; Flash, ½ sec.; Eclipse, 2 secs.; Flash, ½ sec.; Eclipse, 2 secs.; Flash, ½ sec.; Eclipse, 6 secs.

(c) *Etaples Bay (Touquet Point).* It should be noted that this light still has a masked sector of 22° towards the E. The light cannot, therefore, be seen from 259° through W. to 281° (bearing of the light from the aircraft).

2. Previous Notices.

Notice to Airmen No. 68 of 1921, paragraph 4, is amplified by (a) and (b) and amended by (c) of paragraph 1 above.

(No. 102 of 1921.)

THE REQUIREMENTS AND DIFFICULTIES OF AIR TRANSPORT

[UNDER above title a very able and instructive paper was read by Colonel Frank Searle, before the Royal Aeronautical Society on November 17. Unfortunately, lack of space prevents us from publishing the paper in full, as we should have liked to do. It is hoped, however, that the following abstracts will give the main points of the paper and enable those who were unable to attend the reading of the paper to follow the reasoned criticisms, and the suggested remedies for such shortcomings as we have to admit are still hampering the progress of commercial aviation.—ED.]

In his introduction, Col. Searle stated that, after three years of peace, we have sorrowfully, and perhaps shamefacedly, to acknowledge that we have not yet overcome and mastered the problem of serving mankind by air transport. It is, he said, our business to end this failure, and he suggested that the best way to begin is by visualising, as clearly as we can, what are the essential characters of the problem. The lecturer divided the requirements into three groups, the technical, the organisation, and the economic, and expressed the opinion that all these requirements can be met. "The ideal aeroplane," Col. Searle said, "must consist of an engine on which the undertakers of the transport service can rely, not only for steady work, but for long work, at a reasonable maintenance cost. The vehicle it propels, must take the maximum load, with the maximum comfort, the limitation in each case being the speed, certainty and safety, without which air transport can never become a commercial success. And the cost of both must be reasonable."

After pointing out that at the moment there is not in universal use today, an engine which meets the requirements outlined, the lecturer called attention to the state which existed after the War, when firms were staffed by men whose training had been a War-time and War-conditions training, in which the question of cost did not arise, or did not, at any rate, assume the importance which it has in peace-time. The tendency of designers themselves, quite naturally, was also influenced by their experience having been gained in the design for War purposes. Col. Searle referred to the conditions obtaining when he went into the business (which was about 12 months after air transport had been established). He was then told by an authority that an aeroplane could not fly for more than 250 hours a year. This would mean approximately 70 miles per day. Therefore, on a 50 per cent. load, a four-seater machine charging 1s. 6d. per mile per passenger could not possibly earn enough to pay its overhead charges. Firms employed a far greater number of machines than was necessary to obtain even the above unsatisfactory figure, and yet but scant provision was made for spare parts and spare engines, with the consequence that machines were lying idle while their engines were being repaired. This meant that they were not only losing their earning capacity, but that the overheads of about £4 per day per machine were going on for two or three weeks.

In addition, the facilities for carrying on work at Croydon were very poor, many machines having to be constantly moved about in one shed in order to accommodate others arriving at odd times. No bulk storage of petrol existed, and in the opinion of the lecturer an expenditure of £500 on such an installation would have saved the firm £750 the first year.

With regard to the problem of getting passengers to and from the aerodromes, Col. Searle drew a parallel of the procedure in the case of travel by train and boat. At Liverpool the train from London runs alongside the steamer. "You can hardly," he said, "expect the air service to be as comfortable as the train service until some such amenities as these exist. At present, there is no means of getting to the aviation grounds at Croydon, except by car, and, arrived there, there are neither waiting-rooms nor conveniences of any kind for the comfort of the passenger, and he has to walk many hundreds of yards, often through slush and mud, before he reaches the vehicle in which he is to spend two hours nursing his sodden feet to Paris. It is, in my opinion, simply absurd that there should not be a regular service of trains to a platform running alongside the plane at the aerodrome, so that within a quarter of an hour of saying good-bye to his friends in London, the traveller should be seated in his aeroplane, and ready to start." The lecturer suggested that if an aerodrome must be isolated, the Government must subsidise some railway company to provide the necessary connection.

On the question of the economic side of flying, the lecturer pointed out that this is obviously a question of balance between receipts and costs. The speed must be such as to give an overwhelming advantage over any other form of

locomotion, but it must be speed consistent with carrying a considerable load at a running cost which is not excessive, and it must be speed that does not demand either excessive first costs either of engine and aeroplane or excessive upkeep.

Col. Searle then continued:—"The position of the Air Ministry in air transport is a most important question, and one which ought to be cleared up at once. At the present moment it combines the equivalents of Municipal Authorities, Trinity House, the Board of Trade and Lloyd's, and I will deal with the analogous functions in this order.

"In my opinion the Air Ministry must for the time being continue to act as Municipal Authorities in the way of developing aerodromes, and as Trinity House in regard to navigation, but in carrying out these duties every effort should be made to improve the foreign liaison with our neighbours and persuade them forcefully to provide the same facilities on their customs' aerodromes as we provide on ours, as well as equal lighthouses on the routes. France has had far more money voted to civil aviation than we, and yet Le Bourget and St. Ingelvert are disgracefully organised. The London aerodrome should be at least 1,200 yards square, and the adjoining land should be acquired and let out for grazing so as to provide a good take-off in every direction and provide good re-landing possibilities during that period of flight just after taking off. The sheds should be on the lee-side of the aerodrome to prevailing winds so as to minimise taxi-ing, which is a serious cost, and one which was given very little consideration during the War by reason of the fact that it was not necessary to count the cost; but I have no hesitation in saying that five minutes of taxi-ing does more damage to a machine than ten hours' flying. Separate accommodation should be provided for each company, with a common shed for 'casuals.'

"If the Air Ministry are to continue to act Trinity House, as they must, they must accept the responsibility for persuading adjoining countries to do likewise, so that night flying may be made as safe as daylight flying. On the Paris route there should be two lighthouses between Croydon and Lympe, and three or four between Paris, La Plage and Le Bourget.

"In regard to the Air Ministry acting as the equivalent of the Board of Trade and Lloyd's in marine matters, I have no objection to their doing the former's equivalent duties, but with regard to the latter I do feel that the time is here for owners, builders and underwriters to get together and form some sort of Lloyd's Committee so as to keep the Air Ministry advised of their requirements. The question is one of the utmost importance. The Air Ministry has not yet the complete confidence of business-men, and it is necessary for them to have some reliable source of information as to what regulations are necessary for the protection of all their interests. There are some very brilliant young men at the Air Ministry who are most thorough and conscientious in their work; but when one deducts their negative commercial and economic experience of the War, one finds that experience with them cannot be expected. And in a few cases, after deducting their negative War experience, they could not have had more than the meagre engineering or technical training of an apprentice or pupil.

"These men in many cases have the power to dictate as to design and details of operation, and companies have no appeal from their considered opinions, which are invariably based upon war experience and R.A.F. training. Every official in the technical branches of the Air Ministry should be an engineer of good training and undoubted experience, excluding his war service.

"I should also like to mention the examinations for ground engineers. These are verbal examinations, and are therefore the most difficult to organise, and from what I have seen, they have a tendency to follow that unsound policy adopted temporarily years ago in some of the Board of Trade examinations for the marine engineers' tickets—it is that of trying to 'catch' the applicant by trick questions instead of thoroughly ascertaining his education, experience and knowledge. I consider that the examination papers for the applicants for these tickets should be laid down by the committee to which I have referred.

"The wireless on this side is good, but stronger liaison is required with the Continent, where the wireless service even yet, after two years, is still practically useless, and direction finding must be developed to perfection along the whole of the Paris route without delay.

"Some organisation would appear to be necessary for flying in mists and clouds, in that on the organised routes machines flying in opposite directions should have different ranges of altitudes. This, I think, is where the Committee previously referred to should make some recommendations, and it is

most important that the Meteorological Office should collect information from machines in the air and distribute it within a few minutes, when the information would be of great practical value.

"The time must be fairly near when emergency landing grounds will not be required, but I think that for two years more the Air Ministry should maintain two landing grounds between Croydon and Lympne, and they should insist upon the French providing one near Abbeville and another near Beauvais.

"I will now turn to the subject of aeroplanes and engines, and the first remark I will make is that manufacturers must guarantee their productions for a reasonable period after delivery; the guarantee must include the risk of parts having to be re-designed owing to faulty design in the first place. It is no use a manufacturer selling a batch of engines, and after three months admitting that the compression is too high and offering to supply new sets of pistons for £60 or £100 per set, and then after another three months admitting that the connecting rods are of unsuitable design, and refusing to replace them except at the cost of over £200. I can only say that those manufacturers who are not prepared to guarantee their goods for the purpose for which they were purchased will be left without orders as soon as opportunity occurs. I am glad to say that there are signs of some manufacturers of machines taking some of the responsibility for their design.

"In the interests of aircraft manufacturers, I should like to sound a modest note of warning to the effect that they should not let history repeat itself by forcing the air transport companies into manufacturing their own machines, due to high prices, as has been the case with other forms of passenger transport. They must bear in mind that it is difficult for a manufacturer to retaliate, since he must make his machines suitable for as many markets as possible, and therefore cannot specialise.

"To my mind the price of the present-day machine is altogether too high, although efforts seem to have been made to reduce the price. With the present wood construction, which still presents outstanding advantages, I am sure a lot more can be done. The all-metal machine seems as far off as ever, and I doubt very much whether it will ever be nearer than a composite of metal and wood.

"Notwithstanding the many times I have expressed my

candid views on such questions as engine installation, cowling, controls, etc., I find very little improvement today in most of the latest designs of aeroplanes; and the War-type practice in many cases appears to be very deep rooted.

"Also there still appears to be a strong tendency in design to put appearance, in the way of pleasing exterior lines, before utility and service. In the design of the various metal clips and fittings on our aeroplane I plead for the use of ordinary commercial mild steel plate, which after working requires only the crudest annealing. In speaking of the propeller, I think that it is time a weather-proof propeller was in transport service. A metal propeller fills the bill if it does not weigh too much or absorb too much power, but I think we are on the wrong lines still trying to use a metal tip on to a wood propeller, which twists and stretches all the time it is working.

"The continued use of the pneumatic tyre surprises me. I feel sure that a solid-tyred wheel can be designed which will transmit safely all the shocks and forces to the undercarriage damping gear, and yet not be too heavy.

"On the subject of engines, my chief complaint is the cost of the engine and spare parts. I give a few examples and comparisons. One of the best-known modern aeroplane engines costs £6,000 per ton. Complete machinery, including boilers and all auxiliaries, for a 35-knot destroyer costs only £200 per ton. Complete machinery, including boilers and all auxiliaries, for a 25-knot cross-Channel vessel costs about £90 per ton. I am told that the reason for the high cost of the aeroplane engine is due to the expensive material and still more expensive testing and heat treatment. If this is a fact, then we must sacrifice 20 per cent. of the engine weight and get down to an article which will appeal to the commercial engineer, an engine which will run 30,000 miles without overhaul, and I am sure that one giving such results could soon be evolved if the type tests for these engines were made on the time-table basis. I suggest three 3-hour stretches a day with one hour's interval between, during which time the engine must not be touched: the engine to start at the same hours every day until 300 hours is reached, ten minutes being allowed before the time-table time for starting and warming up to full power. The three-hour stretches should comprise 10 minutes at the start at full power, then 75 per cent. full power for the remaining 2 hrs. 50 mins. The engine that can stand up to this test, even if its price is not lower than say 25 per cent. below present prices, will fill the bill."

IN PARLIAMENT

Staff College, Andover

MR. ALFRED T. DAVIESON on November 10 asked the Secretary of State for Air whether it is proposed to establish a Royal Air Force Staff College at Andover; what will be the cost of establishing such a college; what will be the annual charge on the Exchequer; and whether arrangements can suitably be made to avoid this expense or the greater part of it by utilising centres equally convenient and already established?

Captain Guest: It is proposed to establish a Royal Air Force Staff College, as stated, at Andover, where buildings (and an aerodrome) are already available and where the initial expenditure can consequently be limited to a sum of £21,000 for reconditioning buildings. The annual cost is estimated at £39,000. The proposal to establish such a staff college is not, of course, a new one, as the House was informed of this intention on Page 6 of Commanding Paper No. 467, which was laid before Parliament in November, 1919. The original scheme was to establish this college at the Royal Air Force training centre at Halton, but it was found, on examination, that this necessitated buildings, which would have cost £140,000 to erect, and, in view of the urgent need for national economy, the proposed Air Pilotage School at Andover was greatly reduced in size and scope, thereby making it possible to find accommodation at this station for the staff college, without embarking on a new building programme.

State Assistance for Civil Aviation

MR. RAPER asked the Secretary of State for Air whether His Majesty's Government is willing to adopt the three following general proposals with a view to assisting civil aviation: The guarantee by the State of interest to a large national air transport company, to which would be granted a monopoly of all British routes for a term of years; a mileage subsidy to all British aircraft with a British crew, no matter where flown; and a guaranteed load of mails to selected services at liberal rates; and, if not, would he state his reasons?

Captain Guest: The proposals referred to by my hon. friend have received very full and careful consideration. The proposal to establish a National Air Transport Company with a monopoly of all British routes for a term of years was not adopted because it would preclude the growth of private initiative to the ultimate detriment of British civil air development. It would also presume the continuation of direct State assistance to air transport for an indefinite period. The reasons for the rejection of the other two proposals were stated in the Report by the Advisory Committee on Civil Aviation regarding Government Assistance for the Development of Civil Aviation (Cmd. 770 of 1920), and are as follows:

"Methods of affording Direct Assistance.—We have considered various methods by which a direct grant might be given and the basis upon which it should be assessed, and have approached the problem as involving the transport by air of passengers, goods, and mails.

The question of the payment of grants on the basis of the number of miles covered, or of the number of hours flown, has been discussed, and we have had before us details of the French scheme in operation which is based on this principle.

We have been forced to the conclusion, that any such scheme of grants is fundamentally unsound, as the grants can be earned without any direct return to the State or community, either by way of experience gained, useful work performed, development of more efficient machines or establishment of regular air routes. We have, therefore, discarded the policy of giving grants on such a general basis.

We have also considered the advisability of making the payment of a grant dependent upon the carriage of a guaranteed load of mails within a fixed maximum time, but have found the practical application of such a system too difficult to warrant its adoption. This method has the further grave defect that it might often involve the State in the payment for certain services which might not, in fact, have been performed."

The Handasyde Aircraft Co., Ltd.

In our issue of November 10 we published a *résumé* of the British Aircraft Manufacturing Industry as it exists today. Among the firms included was that of the Handasyde Aircraft Co., Ltd., about whom, as explained at the time, we had not been fortunate enough to obtain any information, enquiries made at the office at 11D, Regent Street, having resulted in a statement by the hall porter that the firm had transferred their office elsewhere. We are now glad to learn that this is not the case, and that the firm still has offices at Carlton House, 11D, Regent Street. Of the well-known members of the firm, mention may be made of Mr. G. H. Handasyde, Mr. Hamilton Fulton and Mr. F. P. Raynham. This is a combination which should be capable of great

things, and we hope to have something more to say about the firm's work shortly.

Blackburn Torpedo-Planes.

It is almost inevitable that in the rush of compiling and publishing a special issue dealing with all the aircraft manufacturing firms some slips should be made. Nor did we apparently escape altogether as regards our issue of November 10. Our attention has been called to an inscription under the photograph on p. 727, "An early type Blackburn torpedo-plane releasing its load." It has been pointed out that this machine is in reality a Sopwith "Cuckoo," built by the Blackburn company, and that therefore the inscription should, to be absolutely correct, have read "Blackburn-built."

THE ROYAL AIR FORCE

London Gazette, November 8

Permanent Commissions

Flying Officer A. J. Prince-Cox is placed on the retired list on account of ill-health, and is granted the rank of Capt.; November 9.

Short Service Commissions

The following are granted short service commissions, in the ranks stated, with effect from, and with seniority of, the dates indicated, except where otherwise stated:—

Flying Officers (from Flight-Lieuts.).—R. S. P. Boby; October 28. B. K. D. Robertson, A.F.C.; November 1.

Flying Officers Boby and Robertson will be placed at the head of the list of Flying Officers, but junior to all officers similarly reduced in rank on the grant of permanent or short service commissions.

Flying Officers.—T. B. Tully, A.F.C.; November 1. B. C. W. Windle, D.F.C.; October 27.

Pilot Officers on Probation.—C. C. K. Bloxam, K. R. Boulton, * J. J. Comerford, C. B. Horsfield, S. S. Kirsten, C. McL. Reid, M. V. Ward; November 1.

* Denotes previously served in R.A.F.
The commn. of Pilot Officer on probation J. W. Stansfeld is terminated on cessation of duty; October 9. Flight-Lieut. L. A. Hervey resigns his commn.; October 24.

Medical Branch

H. L. Burton, M.B., is granted a short service commn. as a Flight-Lieut. with effect from, and with seniority of, October 24.

Flying Branch

Pilot Officer A. B. Morris to be Observer Officer; March 28, 1920 (since demobilised). Lieut. A. B. Morris is transferred to the unemployed list; September 10, 1920 (substituted for *Gazette* September 21, 1920).

Dental Branch

The following Flight-Lieuts. to be Squadron Leaders on promotion to Major in the Army Dental Corps:—C. L. Colbran; April 1. D. Blair; October 1.

Nursing Service

The following ladies are confirmed in their appointments as Staff Nurses, to date from January 27:—Miss M. E. Edwards, Miss G. P. Faulkner, Miss D. France, Miss J. D. Jackson.

Errata

In Honours published in *FLIGHT*, December 5, 1918, p. 1369.—For Maj. (A.-Lt.-Col.) Alwyn Vesey Holt, D.S.O., read Maj. Harold Edward Sherwin Holt.

London Gazette, November 11

Permanent Commissions

Air-Com. H. R. M. Brooke-Popham, C.B., C.M.G., D.S.O., A.F.C., relinquishes appt. of Director of Research Air Ministry; Nov. 14. Flight-Lieut. G. H. Hall, A.F.C., is placed on half-pay, Scale B; Oct. 26.

Stores Branch

Flight-Lieut. D. W. Wilson to take rank and precedence as if his appt. to rank of Flight-Lieut. bore date Jan. 1, immediately following Flight-Lieut. W. Thorne.

Short Service Commissions

The following Pilot Officers on probation are confirmed in rank: A. E. Rogenhagen; Oct. 15. S. R. Boldero, A. D. H. Foster, W. J. Gayes, A. E. L. Scott-Atkinson, E. A. Slater, K. R. Thomas; Oct. 28.

Seconding, Etc.

Squad-Leader (acting Group Capt.) F. H. Moody, M.C. (Maj. I.A.), is re-seconded for five years' duty with R.A.F.; April 1.

Technical Branch

Flying Officer A. Deakin is placed on half-pay, Scale B, from Aug. 15 to Oct. 13, and from Oct. 19, 1921, to Feb. 19, 1922, inclusive. *Gazette* April 13, 1920, concerning Flying Officer J. L. Denman is cancelled.

London Gazette, November 15

Permanent Commissions

Wing-Comdr. T. R. Cave-Browne-Cave, C.B.E., is apptd. Deputy Director of Airship Research, Air Ministry, with effect from Jan. 1, 1920, and relinquishes that appt., with effect from Nov. 14.

The follg. are placed on half-pay, Scale B:—Group-Capt. U. J. D. Bourke, C.M.G.; Nov. 15. Sqdn.-Ldr. T. G. Hetherington, C.B.E.; Nov. 6. Flying Offr. S. L. Quine, M.C.; Nov. 13.

Short Service Commissions

The follg. are granted short service commissions, in the ranks stated, with effect from, and with seny. of, dates indicated:—

Flying Offr.—J. H. Page; Nov. 8.

Pilot Offrs. on Probation.—F. Beesley, * J. F. Bythell, G. H. Marshall, W. T. D. Windham; Nov. 2. L. B. J. Bunstead, M.C., T. C. Dodd; Nov. 3. W. Pritchard; Nov. 4. H. W. Beck; Nov. 8. (previously served in R.A.F.).

Flying Offr. J. C. Fitzmaurice resigns his commn., and is permitted to retain rank of Lieut.; Nov. 10.

Chaplains' Branch

The Rev. M. J. Dunne resigns his commn.; Nov. 3.

Seconding

Lieut. W. R. F. Clover, M.C., R.G.A., is granted a temp. commn. as a Flying Offr. on seconding for four years' duty with the R.A.F.; Nov. 1.

Flying Branch

Sec. Lieut. B. E. Essex to be Lieut.; Oct. 11, 1918 (substd. for *Gazette* March 7, 1919). Pilot Offr. F. J. Bell to be Observer Offr.; April 15, 1920. Lieut. F. J. Bell is transferred to the unemployed list; June 22, 1920 (substd. for *Gazette* July 2, 1920). The follg. relinquish their temp. commissions on ceasing to be employed, and are permitted to retain their rank:—Lieut. P. J. Moloney; Sept. 13, 1919. Sec. Lieut. R. C. Williams; Oct. 31, 1919.

Administrative Branch

Lieut. J. P. A. Donaghy relinquishes his temp. commn. on ceasing to be employed, and is permitted to retain his rank; Nov. 1. Lieut. (actg. Capt.) I. Wardle relinquishes his temp. commn. on ceasing to be employed, and is granted rank of Capt.; Nov. 1.

Memoranda

The permission to retain rank granted to the follg. is withdrawn, with effect from the dates they joined the T.A.:—Lieut. T. M. Cornish, Lieut. H. J. E. Smith, Sec. Lieut. J. W. Davies.

London Gazette, November 18

Flying Branch

The permission granted to Lieut. C. H. Harwood to retain his rank is withdrawn on his joining Army; September 26.

Dental Branch

The names of Flight-Lieut. Lawrence Somerville-Woodiwiss are as now described, and not as *Gazette* October 25.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

Wing-Commanders.—J. N. Fletcher, A.F.C., from Inter-Allied Aeronautical Commission of Control (Hungary) to Air Ministry (D. of E.) for Stores Staff duties. 14.11.21. H. R. Busteed, O.B.E., A.F.C., from Marine and Armament Experimental Establishment (Coastal Area) to command R.A.F. Base, Gosport (Coastal Area). 14.11.21. N. J. Gill, C.B.E., M.C., from R.A.F. Base, Gosport (Coastal Area) to R.A.F. Depot (Inland Area). (Super-numerary.) Whilst awaiting embarkation for India. 14.11.21. A. D. Cunningham, C.B.E., from Air Ministry (D. of E.) to R.A.F. Depot (Inland Area). (Super-numerary.) Whilst awaiting embarkation for Middle East Area. 14.11.21. P. B. Joubert de la Ferte, C.M.G., D.S.O., from Air Pilotage School (Cadre) (Inland Area) to Air Ministry (D.O.I.) for duty as an "Attached" Officer. 4.11.21.

Squadron-Leader T. G. Hetherington, C.B.E., from Headquarters (Inland Area) to Half-pay List. 6.11.21.

Flight-Lieuts.—G. H. Hall, A.F.C., from No. 1 School of Technical Training (Boys) (Halton) to Half-pay List. 26.10.21. E. N. H. Gray, D.P.H., from R.A.F. Base, Leuchars (Coastal Area) to Headquarters, R.A.F., India. 2.11.21. C. St. Leger Campion, from No. 4 Squadron (Inland Area) to No. 100 Squadron (No. 11 Irish Wing). 10.11.21. J. R. Crolius, M.B., from Research Laboratory and Medical Officers' School of Instruction (Inland Area) to No. 4 Squadron (Inland Area). 7.11.21. F. M. Rope, from Air Ministry (D.G.S.R.) to Aeroplane Experimental Establishment (Inland Area). (Super-numerary.) For flying duties. 1.12.21. T. H. Evans, from No. 3 Stores Depot to Central Pay Office (Inland Area). For duty as Inspector of Accounts. 15.11.21. C. H. Young, M.B., from Headquarters, No. 11 (Irish) Wing to R.A.F. Depot (Inland Area). 11.11.21. J. G. Skeet, from Inland Area Aircraft Depot (Inland Area) to No. 5 Flying Training School (Inland Area). 31.10.21. P. A. Hall, M.B., B.A., to R.A.F. Depot (Inland Area), on ceasing to be attached to School of Army Hygiene. 3.11.21. B. J. Silly, M.C., D.F.C., from No. 1 School of Technical Training (Boys) (Halton) to Central Flying School (Inland Area). For Flying Instructors' Course. 15.11.21.

Group-Captain.—U. J. D. Bourke, C.M.G., from Palestine Group Headquarters (Middle East Area) to Half-Pay List. 15.11.21.

Squadron-Leaders.—P. R. Burchall, O.B.E., from Headquarters, No. 11 (Irish) Wing, to Half-Pay List. 15.11.21. F. H. Unwin, O.B.E., to Aircraft Depot, Egypt (Middle East Area), on ceasing to be attached to Headquarters (Middle East Area). 27.10.21.

Flight-Lieutenants.—L. J. St. G. Bayly, M.C., from No. 207 Squadron (Inland Area) to No. 1 School of Technical Training (Boys) (Halton). 24.11.21.

A. D. Pryor, from No. 207 Squadron (Inland Area) to No. 100 Squadron (No. 11 (Irish) Wing). 21.11.21. E. M. Pizey, from No. 207 Squadron (Inland Area) to No. 4 Squadron (Inland Area), to be attached to No. 100 Squadron (No. 11 (Irish) Wing). 24.11.21. H. B. Russell, A.F.C., from No. 2 Squadron (No. 11 (Irish) Wing) to No. 39 Squadron (Inland Area). 28.11.21. C. P. O. Bartlett, D.S.C., from No. 1 School of Technical Training (Boys) (Halton) to No. 39 Squadron (Inland Area). 28.11.21. D. L. Ingpen, to Headquarters, R.A.F., Cranwell, on ceasing to be attached to Headquarters (No. 11 (Irish) Wing). 14.11.21. J. S. Holloway, from No. 1 School of Technical Training (Boys) (Halton), to No. 207 Squadron (Inland Area). 28.11.21. J. F. Gordon, D.F.C., from No. 4 Squadron (Inland Area) to No. 207 Squadron (Inland Area). 28.11.21. E. E. Deans, D.S.C., from No. 39 Squadron (Inland Area) to No. 2 Squadron (No. 11 (Irish) Wing). 24.11.21. E. C. Emmett, M.C., D.F.C., from No. 39 Squadron (Inland Area) to No. 1 School of Technical Training (Boys) (Halton). 24.11.21. J. H. D'Albiac, D.S.O., from Headquarters, Middle East Area, to No. 4 Flying Training School (Middle East Area). 24.10.21. L. H. Pakenham-Walsh, D.F.C., from No. 2 Flying Training School (Inland Area) to No. 100 Squadron (No. 11 (Irish) Wing). 21.11.21. P. G. Scott, from No. 3 Squadron (India) to No. 31 Squadron (India). 1.10.21. G. H. Hooper, M.C., D.F.C., from No. 100 Squadron (No. 11 (Irish) Wing) to No. 207 Squadron (Inland Area). 21.11.21.

Squadron-Leader.—L. A. Pattinson, D.S.O., M.C., D.F.C., from R.A.F. Depot (Inland Area) to School of Army Co-operation (Inland Area). Attached for temporary duty. 2.1.22.

Flight-Lieutenants.—C. E. W. Foster, from No. 20 Squadron (India) to No. 5 Flying Training School (Inland Area). 17.10.21. F. T. Allen, from School of Naval Co-operation and Aerial Navigation (Coastal Area) to Sea-plane Training School (Coastal Area). 2.11.21. To R.A.F. Depot (Inland Area). 22.11.21. W. B. Wilson, from R.A.F. Base, Leuchars (Coastal Area) to School of Naval Co-operation and Aerial Navigation (Coastal Area). 5.11.21. C. H. B. Thompson, from R.A.F. Airship Base (Coastal Area) to R.A.F. Base, Leuchars (Coastal Area). 28.10.21. H. L. Burton, M.B., to Research Laboratory and Medical Officers' School of Instruction (Inland Area). For duty as Medical Officer on appointment to Short Service Commission. 24.10.21. J. Paxton, to Research Laboratory and Medical Officers' School of Instruction (Inland Area). For short course of instruction on appointment to Temporary Commission. 3.11.21. To R.A.F. Base, Gosport (Coastal Area). 17.11.21. C. S. Morice, M.C., from Air Ministry (D.T.O.) to Central Flying School (Inland Area). (Super-numerary). For Flying Instructor's course. 23.11.21.

